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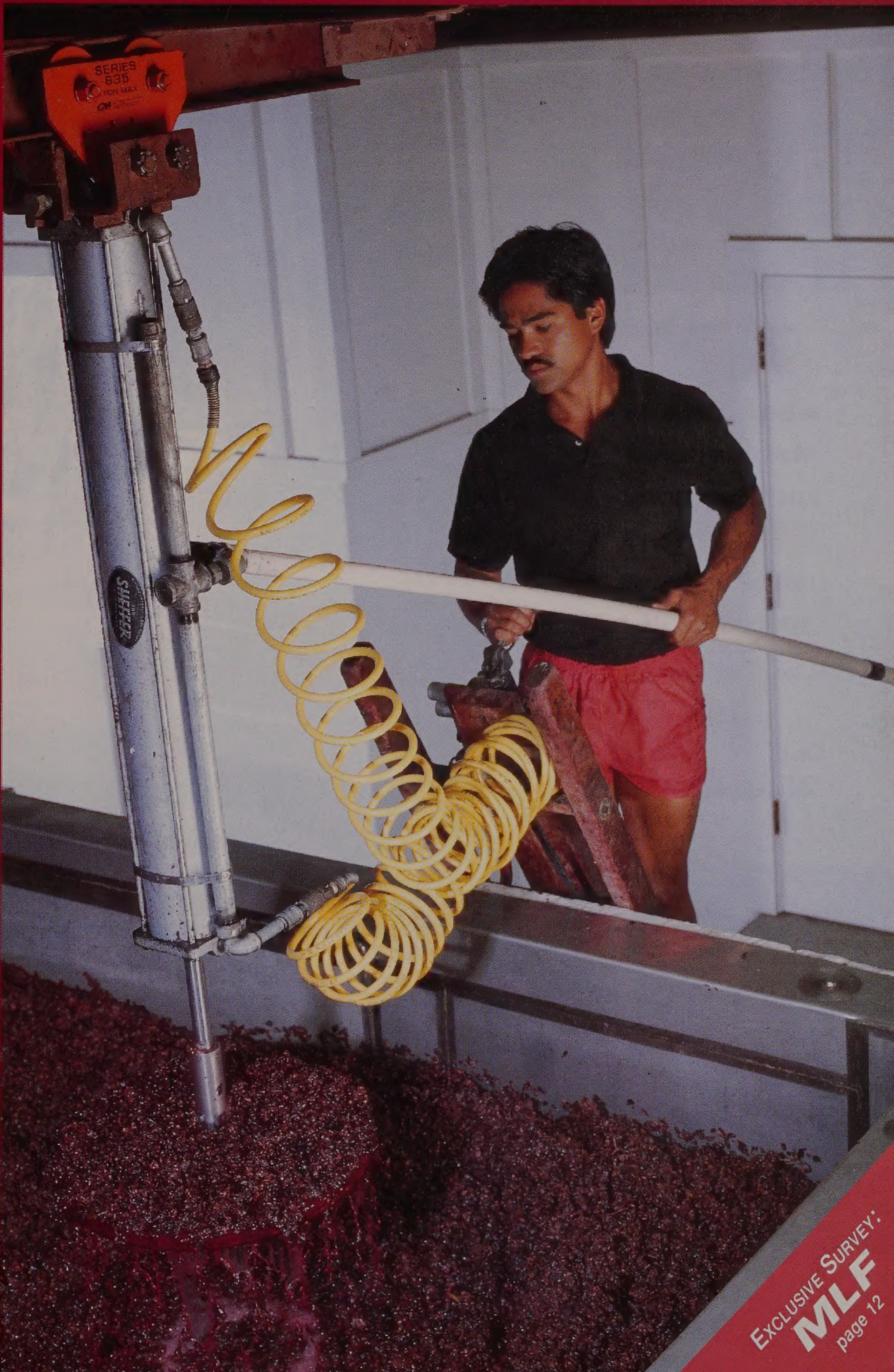

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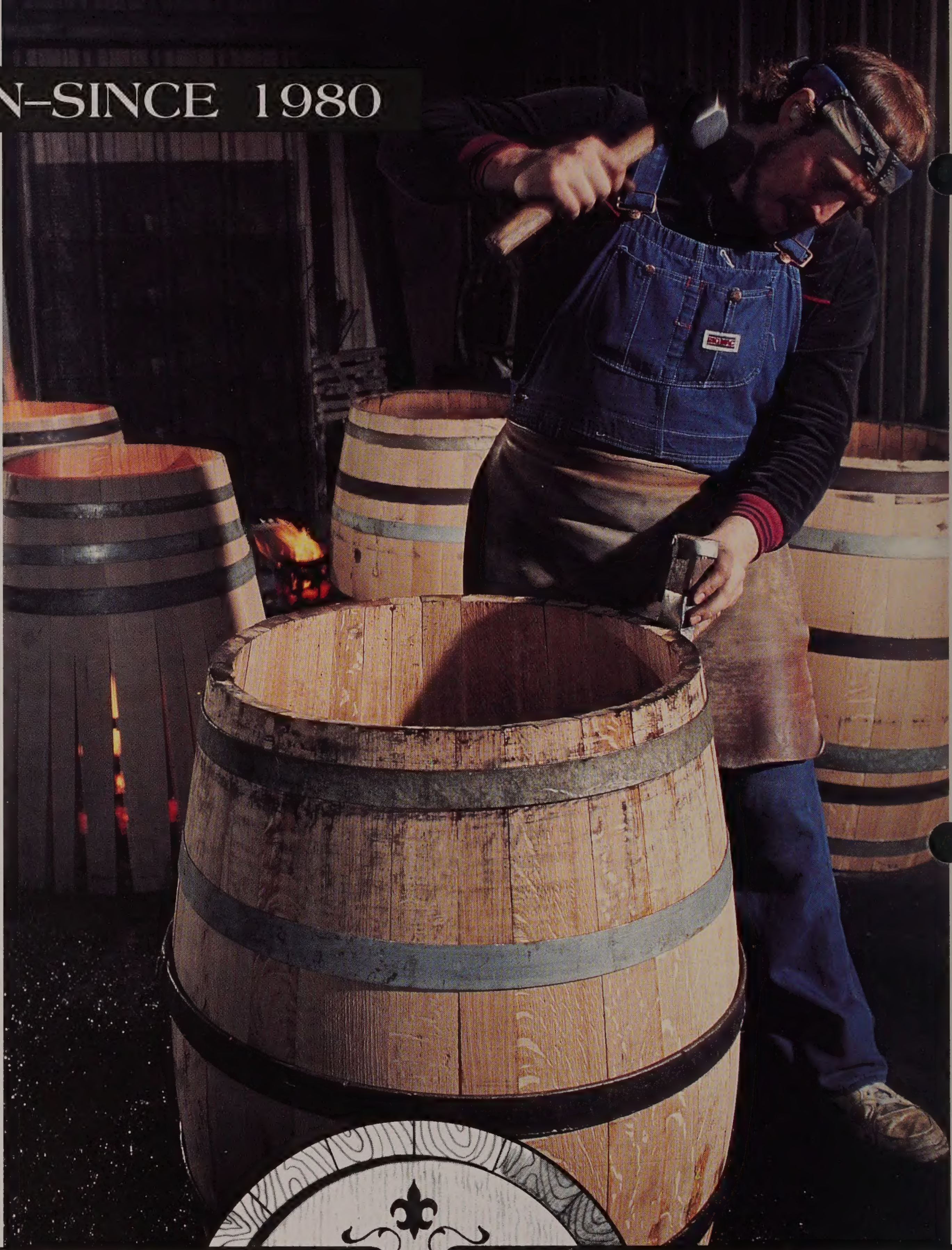

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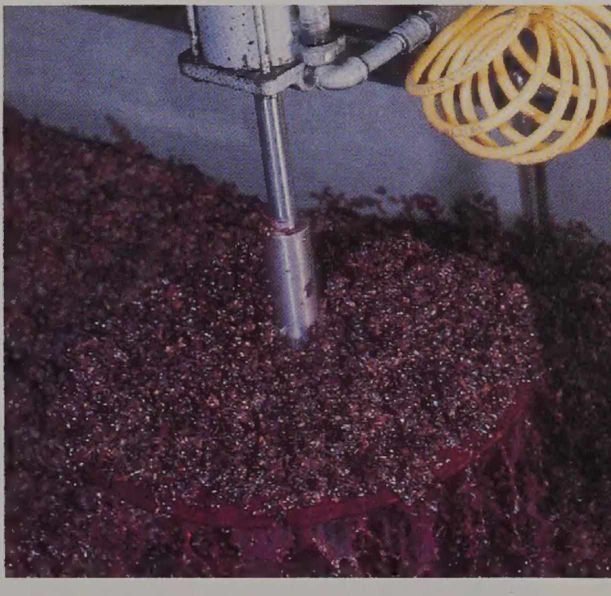

COVER: Punchdown of Pinor Noir at Bouchaine. See page 52. PHOTO BY: Scott Clemens

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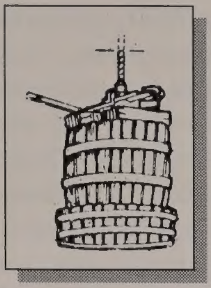

WINE LOVERS: Speak from the heart!

**By Patrick Campbell, President
Family Winemakers of California
Owner/Winemaker,
Laurel Glen Vineyard, Glen Ellen, CA**

In late February, scores of winery principals and growers from 34 states converged on Washington, D.C., to celebrate American Wine Appreciation Week. Under the circumstances of the hour — threatened excise tax increases, continuing over-regulation by zealots, and tough financial times — 'suffering,' rather than 'celebrating,' might have better described our mood when we arrived.

But as we met with hundreds of our representatives, senators, staffers, agriculture and health committee members — even the President — our attitude improved.

We talked of environmentalism, family farms, healthy hearts, tourism, economic burdens, open space, international trade, social values, increased competition, and hard-to-get loans. We all carried the same message: an increase in the excise tax is unfair and fiscally counterproductive.

Just the innocent pleas of yokels in the halls of cynicism? Stout yeoman up against the Gucci set?

Perhaps not. Our message was heard. Time and again they told us: "We have wineries in our districts of which we're proud. We understand the distinction between abuse and moderation. Table wine is not the beverage of abuse. Winemakers are farmers."

"Write letters to the White House; write the letters 'from your hearts' and become part of the process," they counseled. "You have a good story: tell it to your representatives in Washington. A typical political brush-off, oozing concern while counting votes? Those Washington folks gave us good advice. Politicians ultimately make their decisions by counting votes. They have to; it's their job. The more letters we send and the louder our voices, the greater their support.

For this reason, if you care about the future of wine in the United States, it's time to sit down and be counted. Grab your chair. Put pen to paper. Write a letter. Here's mine:

The President
and Mrs. Hillary Rodham Clinton
The White House
Washington, DC 20500

Dear President and Mrs. Clinton:

We have a task ahead of us that demands the efforts and cooperation of **all** Americans. Thus it is no longer acceptable to exempt any one segment of society from doing its fair share.

I emphasize ***fair*** share. I pay taxes. I'm subject to regulations, and I get by just like any other American. But unlike most Americans, I pay a higher percentage of my income in taxes, suffer a greater regulatory burden, and may soon have a harder time just getting by than my peers in other fields.

That's because I own a winery.

For the past 20 years — all my adult life — I have grown wine grapes in Sonoma County, CA. I am a farmer with 40 acres of vineyard, a winemaker producing 20,000 cases of wine, an entrepreneur in a risky venture, a small businessman selling his product in a global market dominated by huge multi-national producers.

I understand that you are considering yet another increase in wine taxation as part of the Health Care Reform Package. Because wine consumption causes health problems — so the argument goes — wine should be taxed to pay for the attendant increase in health costs. This would make sense under the 'fairness' test if wine consumption were actually a health cost liability, as is, for example, tobacco. But in reality, wine is a net health cost asset.

These days there is simply not a single credible group that denies the salubrious effects of moderate wine consumption. The American Heart Association, federal alcohol regulation agencies, doctors, and public health researchers, all agree on this point. It is not a matter of speculation. It is a matter of fact.

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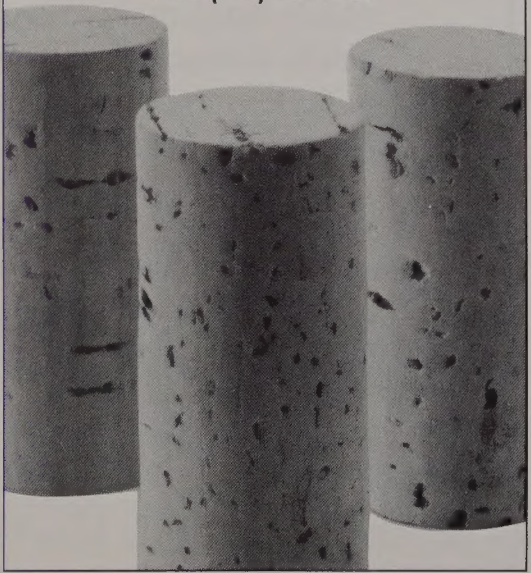

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from the nation's number one killer: heart disease. The cost to the nation: $120 billion. Moderate wine consumption (a couple of glasses per day) decreases heart disease 25% to 40%. Thus, moderate wine consumption saves billions in health cost dollars. Again, this is not a matter of speculation. It is a matter of fact.

Applying the test of fairness then, yet another tax increase is unwarranted (federal excise taxes on wine were raised about 550% two years ago). We have already paid more than our fair share.

Equal to your insistence on fairness is your commitment to education. Without access to the facts, a populace cannot be informed and a democracy cannot function. For too long, though, we have suffered a government committed to telling half-truths when the facts did not fit the policy, a stance inimical to informed choice.

A case in point is the absolutist, "Just Say No" mentality promoted by the previous administrations. This simplistic attitude directed a generation of public policy makers to treat wine as a drug. Wine was regulated, bashed, and controlled, because the excesses of its abuse were regarded as a likely consequence of its use. In reality, the campaign scared off the moderate drinker (consumption has fallen every year since 1985) and did little to lower the number of abusive drinkers. Unfortunately, nothing has changed since.

We in the wine industry care deeply about excessive drinking. That's why we want ***real*** solutions, free from rhetoric and platitudes. Educate our people, tell the truth: abuse is bad and must not be tolerated. But moderation is socially and medically beneficial.

Perhaps above all, where has "the pursuit of happiness" gone? The beverage of the Bible that "makes glad the heart of man" has become the liquid equivalent of crack cocaine. Our country has become so serious in its grim national obsession with zero risk tolerance that we have come to deny the good and the beautiful.

You both have brought a new sense of humor, love, and rationality to the White House. May these qualities guide your administration's attitude about wine.

My fellow winery owners in 44 states join me in wishing you a wonderful term that's long on fairness and short on intolerance.

We look forward to working with you.

Good luck!

That's my letter.

I encourage you to share your thoughts with the Clinton administration and your local representatives. If you grow grapes, make wine, sell wine, or just enjoy it, do yourself a favor: let the President know your thoughts. Because federal policy sets the tone for regional policy, we must stop all anti-wine legislation on the national level now.

Hurry. Time is of the essence, because the Health Care Reform Package may well be set in stone very soon.

Write your letters from the heart. Short or long, simple or detailed, it doesn't matter. Politicians do listen to the public, and at this very moment, zealots are imploring the administration to increase taxation and impose ever more stringent regulations on wine.

Now is a pivotal moment for the wine industry. May every wine lover do his duty! ■

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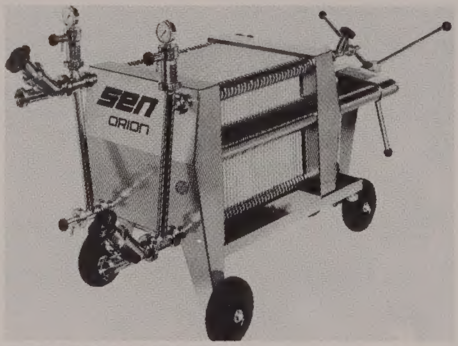
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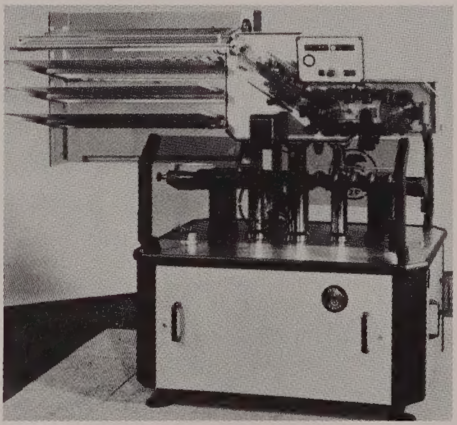
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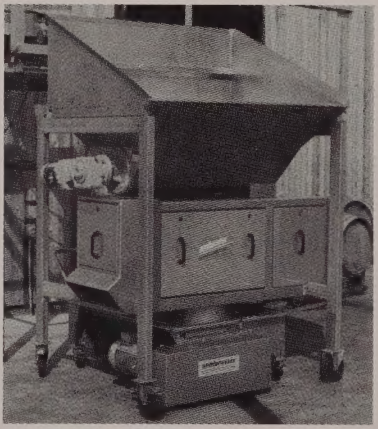
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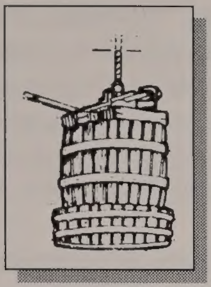


Promoting farm wineries — and wine farming

By James Tresize, President, New York Wine & Grape Foundation

How do you think a dairy farmer would feel if the Bureau of Alcohol, Tobacco, and Firearms (BATF) suddenly became the Bureau of Alcohol, Tobacco, Firearms, and Milk? Or if special occupational and excise taxes were imposed by both federal and state governments on various milk products, because they can cause health risks if abused?

Can you imagine how much the government would tax whipped cream? And what if milk producers were prevented by federal regulators from advertising the legitimate health benefits of milk? The dairy farmers would go ballistic, as they should. And they'd go right to their legislators with a unified voice to correct the situation and demand fair and reasonable treatment.

They'd explain that cows are raised on farms worked by families who have invested their future in the business. (So are grapevines.) And that milk is a natural product which is transformed into several different end products for consumers. (So are grapes.) And that while there may be some health risks associated with the improper use of the products, those products have scientifically-verified benefits, when used properly. (So does wine.) And that dairy farming is a good thing for this country. (So is wine farming.)

Farm winery = wine farm

What is a farm winery? It's a farm that makes wine. The land is planted with vines which grow and eventually produce an annual crop of grapes. When those grapes ripen each fall, the farmer harvests them, extracts the juice, adds some yeast, and transforms the grape juice into wine, one of the nutritional staples, social lubricants, and spiritual elixirs of civilization. In other words, wine is fermented grape juice, just as cheese is fermented milk. Simple, huh?

Yes, until the lawyers get involved. The first lawyers who messed things up were the ones who included wine as an "intoxicating liquor" when Prohibition was repealed. The Federal Government passed the buck to the states as to how to regulate alcoholic beverages.

Then the state lawyers added their obfuscation by inventing a jungle of 50 different sets of laws and regulations that only a lawyer could navigate, obviously at a huge fee. So it's virtually impossible to market your wine beyond your state's borders, and not very easy, even within them.

So now what we have in the USA are some 1,400 small family farms in 44 states struggling to produce a natural, nutritious, high-quality product which enhances the quality of life. But they are hamstrung by laws and regulations harking back to Prohibition; by taxes that are unwarranted, unfair, and unwise; and by powerful forces who want to keep it that way.

The wine industry is regulated by the BATF. I have dealt with many government bureaucracies over the years, and in my experience, BATF is the most reasonable, responsive, and responsible.

Still, let's look at the twisted logic of this situation. Why is wine treated as alcohol rather than as agriculture, and unjustifiably lumped with spirits and beer? Though it has some health benefits, when used in moderation, why is alcohol lumped with tobacco, which has absolutely none? Why on earth is alcohol in the same agency as firearms? Maybe I'm missing some mysterious connection between Chardonnay and assault weapons.

Perception, Politics, Profits

Why promote farm wineries and wine farming? Because the bottom line is that ***perception*** drives ***politics***, and ***politics*** defines ***profit*** potential.

Perception is reality, and the perception of our wine industry ultimately defines the reality within which we must operate. Are you a wine farmer or a booze merchant? Is your product natural and nutritious or dangerous and deadly? Does wine enhance the quality of life or destroy lives and families?

The answer to all three questions is the same: It depends on how you look at it. And that's why I believe that in order to 'grow the industry,' the wine industry must change the perception of wine in America. It is the single most important challenge for the industry to pursue.

Why? Because the public and politicians make decisions and policy based on perception — on what they think, and what they think other people think. Just look at the incredible impact of 'The French Paradox' segment that aired on the "60 Minutes" television program. All of a sudden, millions of health-conscious Americans went out of their way to drink wine. And white-wine drinkers switched to red — any red — because that was supposed to be especially good for you.

That certainly was a welcome change for our industry, which is far more used to being the focus of bad news than good, but the impact is not going to last forever. In fact, many groups are trying to reverse that impact, to confuse wine with liquor, to link alcohol with illegal drugs. All of those groups are more wealthy, more powerful, and more unified than the wine industry, at this time.

That brings us to the bottom line: ***profit.*** Just as perception drives politics, politics defines the profit potential for our industry by shaping the business climate within which we operate. Of 1,400 wineries in 44 states, the vast majority are small family farms operating with few people and even less money in one of the world's most competitive international businesses.

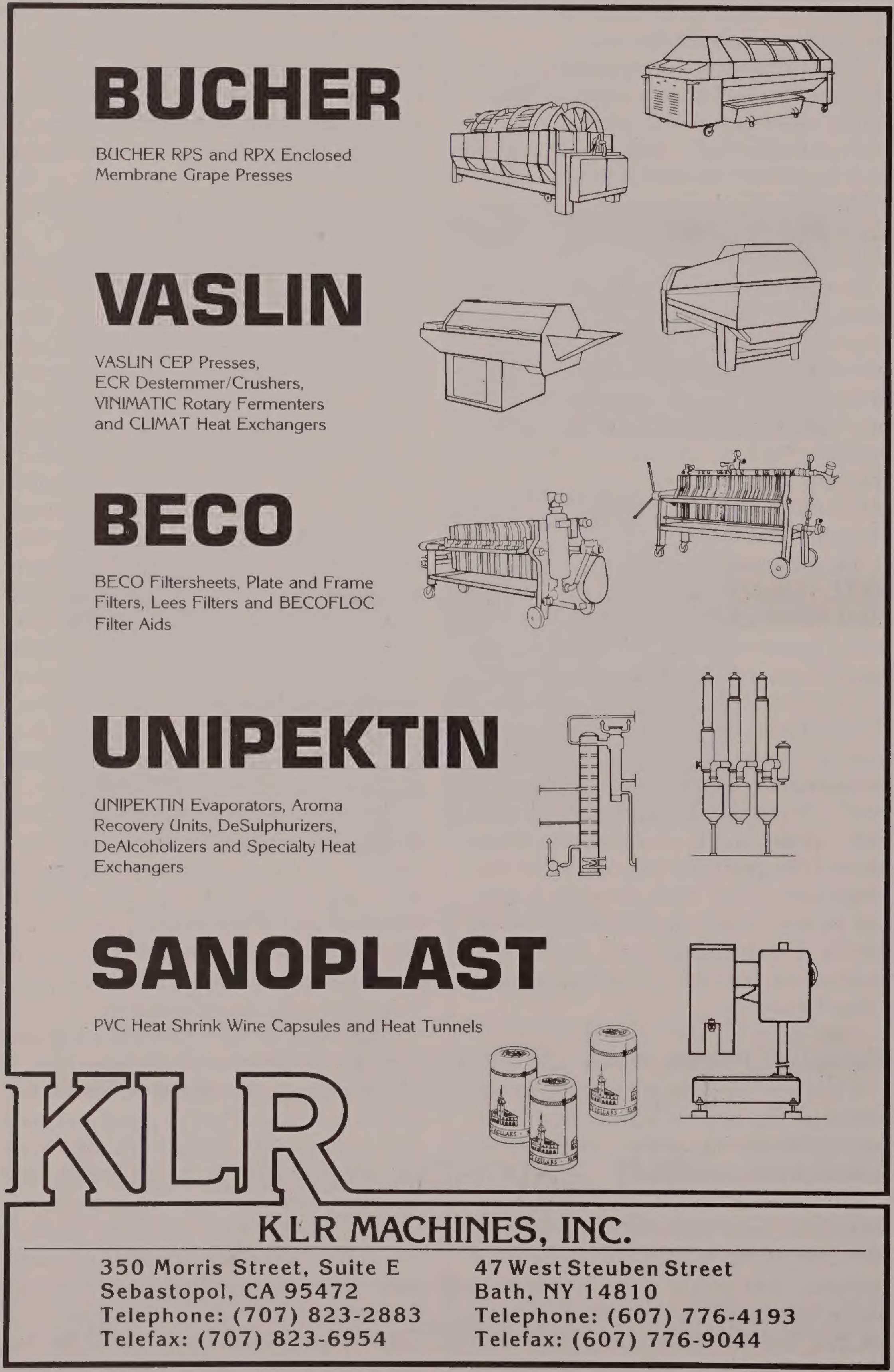
Compared with most other small businesses, the regulatory burden is enormous, and the mutiple layers of special taxes can turn black ink red. If farm wineries and wine farming are to survive and prosper in America, it is crucial to create a business climate that nurtures this agricultural industry.

Promoting farm wineries is a key element in that process not because they're big, or rich, or politically powerful, but precisely because they're small and poor and individually weak. Though they are a tiny segment of the American wine industry, farm wineries have huge potential impact. Their combined production is just a drop in the bottle, compared with large wineries, but their effect on the industry's image is enormous.

Farm winery sales are miniscule, but the tremendous tourism they generate ripples through many sectors of the economy. Their individual political contributions are laughable, but their potential power as a grassroots network is truly awesome. The key to unleashing that power is unity, which is why it is so important that everyone — grower, vintner, supplier, and distributor — join and support one national organization.

Unity brings results. In New York state, growers and vintners came together nearly a decade ago and went to the state capitol speaking one message with one voice. As a result, Governor Mario Cuomo and a bipartisan coalition of legislators initiated a fundamental economic turnaround of the New York grape and wine industry.

A comprehensive package of market-oriented legislation created new markets for our products, deregulated the farm winery industry, and established a long-term partnership between the public and private sectors to support promotion and research. The bottom line is a stronger, economically healthier industry which is now able to contribute more to the state economy in terms of investment, jobs, and tax revenues. It's a win-win-win situation.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Seven secrets of success

How can it be done? Promote farm wineries and wine farming with the seven "S's": Say it, Sign it, See it, Smell it, Sip it, Sell it, and Savor it.

When you talk with people, especially legislators, make sure you link wine with farming, by ***saying*** the buzz words with emphasis (highlighted in following text).

Tell them you and your **family** operate a **small farm winery**, or that you are **wine farmers**, or **winegrowers.** Talk about how many **acres of land** you have, how many **grapevines** you have planted, and why your **soil** is unique. By all means, talk about the **weather** and how it affects your **farm**.

Whatever words you use, get the agricultural connection in right away, even if the listener doesn't understand it at first. The point is, even when you're in an urban area and especially when you're in the halls of your legislature, help your listeners to visualize your **winery as a farm**. *Say it!*

Sign it — with officially approved, attractive highway signs that lead people to and through your wine region and winery. The New York uniform highway signage program, featuring a stylized grape cluster, is probably the single most successful thing we have done in terms of generating tourism, direct sales, and brand loyalty for our farm wineries throughout New York state.

The grape cluster conveys wine's agricultural roots, and the uniform symbol promotes convenience and safety for tourists. The coordinated program has created a new awareness of 'wine country,' and the cost was absolutely miniscule, compared with the return on investment.

By ***see it***, I don't mean that **you** need to see a farm winery — you do that every day. Rather, help **others** see it through your promotional literature and advertising. Saying 'farm winery' conveys a certain mental image. Likewise, use agriculturally-oriented words, illustrations, and photographs in your marketing program to convey the same message to people who may not be able to see your operation first-hand.

Fortunately, these types of images are

often the most attractive and effective communications vehicles anyway, so their agricultural connection is simply an added bonus. But the best way for people to 'see it,' of course, is live and in person, by following the signs right to your winery.

You can help people ***smell it*** — not just the lovely aroma of your wines, but the total aura of your operation. Buying a bottle of wine in a store is just one purchasing decision among many others. But visiting a winery is a unique **experience** that is the best possible advertising you can use and the least expensive.

The people who visit your winery are a captive audience, and this may be your one and only opportunity to convert them into brand loyalists for your wines. Encourage them to 'smell' the operation by strolling through the vineyards. Maybe offer haywagon rides, have picnic tables available, show them the cellar. Encourage them to touch and feel and smell the grapes, tanks, barrels. Treat every visitor as special and unique, and that's exactly what your winery and wines will become to them.

Sipping it — your wine, that is — is probably the most critical element of all in generating sales and building your brand, because a taste is worth a thousand words.

New York wine farms offer numerous opportunities for consumers to sample wines. The most obvious is the winery tasting and sales room, where a guided tasting is typically the last part of a personalized tour. Some wineries offer free tastings, others charge a nominal fee to cover their costs, and still others refund the tasting charge with the purchase of wine.

New York wineries are allowed to operate up to five tasting and sales outlets anywhere in the state, and to sell any New York wine and a wide variety of gift items. Individual wineries and official wine associations also may conduct tastings under a wide variety of circumstances away from the winery, for free or for a fee.

Wineries also may conduct tastings in retail wine stores, and sell wine by-the-bottle at nonprofit farmers' markets. These and other direct marketing opportunities were made possible by the deregulation law I referred to earlier. They have been absolutely crucial in creating awareness of the industry and support for its products.

Selling it may seem obvious; after all, that's why you're in business. But it often seems to get overlooked in terms of both **staff training** and **selling your brand**, rather than just selling your wine. Many people get into the wine business because they love the land, the grapes, the wine; therefore the focus is often on production, rather than marketing and sales.

The assumption, to borrow from the movie "Field of Dreams," is, "Make the wine and they will come" — and they will buy. Wrong. You've got to sell. Again, your winery is the perfect selling opportunity, and your staff is the sales force, so providing them with good, professional sales training is key to your operation.

The New York Wine & Grape Foundation has sponsored some workshops for New York wineries, and the results always have been dramatic. And while selling your wine may be your core objective, remember that wine is sold by

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brand against literally thousands of other better-known brands in a shrinking market. That should lead you to consider complementing your wine sales with other items carrying your brand name. Wine glasses, cork pullers, T-shirts, and similar items will keep repeating your name to your customers.

Now you can ***savor it*** — success, that is. You've said the right words to educate people about farm wineries and wine farming. You've worked with your fellow wineries to grace the highways with signs leading to your region and winery. You've shown people with words and photographs that you grow an agricultural product, a food that enhances other foods and improves the quality of life.

You've let people experience the sights, smells, and sounds of a natural product being coaxed from the earth into a glass. You've let them sip the love of your labors, and explore the flavorful nuances of different grape varieties and winemaking styles. Now you've sold them a bottle or two, or maybe even a case, and a corkpuller and some wine glasses for enjoying it. But most of all, you've sold them on wine, on farm wineries, and on your special brand.

So sit back for a few minutes. Listen to the gentle pop of a cork exiting a bottle, the sensuous sound of the wine being poured, the friendly clink of glasses raised in a toast. Swirl the wine to smell the earth, taste the grapes, and feel the winemaker's caress. Take a sip and savor the flavor of a farm winery. And hold your head up high: You're a winefarmer. ■

(Edited from speech given to the 1992 Florida Grape Growers Annual Conference, November, 1992. A free copy of the original speech is available by writing to Jim Tresize, New York Wine & Grape Foundation, 350 Elm St., Penn Yan, NY 14527.)

In Memoriam

The death of Julio Gallo on May 2, 1993, is a loss not only to his family but to the wine industry as well. He will be remembered as a pioneer in winemaking, helping to set the pace which put California wines on the international map.

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LETTERS

Dear Editor:

What a joy my life as a restaurant wine buyer and just plain wine lover has been since receiving **PWV** regularly for about a year now. Certainly, seeing wine from the perspective of the production industry has been helpful; but I must also say how much I appreciate the more abstract ideas shared by various contributors such as Jake Lorenzo and Patrick Campbell.

In fact, it's Campbell's "Chair & Control Theory" contribution (**PWV**-March/April'93) that has prompted this letter of appreciation. There obviously is no easy answer to problems such as alcohol abuse, particularly for an industry that produces an alcoholic beverage.

I have to agree with Campbell that if the problem exists primarily because 10% of the population has the tendency to abuse alcohol, then remedies should be directed towards this area where the problem lies.

Personally, however, I've always been uncomfortable with the rather adversarial approach taken by many industry representatives to counter neo-pro concerns over alcohol abuse — which is to say that wine is ***not*** harmful, but in fact is ***healthy*** when taken in moderate amounts.

To me, this is as useful (or useless) as the proverbial *"you say neether and I say nither."* A more reasonable approach might be to spend more time, energy and dollars reminding people of wine's gastronomic value — its everlasting role as a compliment to food and social life.

The way I see it: if the primary neo-pro fear of alcohol has to do with ***abuse***, then we need to promote the fact that wine (unlike certain other alcoholic beverages) is not likely to be consumed primarily to get high or to run away from problems. It is usually consumed simply to enhance one's meal, or to commemorate a special occasion.

In other words, it almost always serves a good, rather than bad purpose; and by golly, if no one else is willing to stand up for the cause of ***more good***, then it might as well be us in the wine industry.

At any rate, thank you once again for your time, and for your thought-provoking publication.

Yours truly,
Randal Caparoso
Vice President/partner
Roy's Restaurant, Honolulu, HI

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EXCLUSIVE PWV MLF SURVEY

By K.C. Fugelsang,
Professor of Enology, Dept. of Enology, Viticulture/Enology Research Center, California State University, Fresno, CA
B.W. Zoecklein,
State Enologist, Dept. of Horticulture, Virginia Polytechnic Institute & State University, Blacksburg, VA

Bacterial conversion of malic acid to lactic acid and carbon dioxide, commonly referred to as malolactic fermentation (MLF), is a widely used winemaking practice. Depending upon the strain(s) of lactic bacteria involved as well as intrinsic chemical and physical properties of the wine, by-products of MLF may significantly impact the sensory properties of the wine.

Understanding and effective utilization of this practice has dramatically improved over the last 20 years, a direct result of research efforts and informational networking within the winemaking community.

The most apparent changes that occur during the course of MLF are decreases in titratable acidity [TA] (0.1% to 0.3%, depending upon the concentration of malic acid), with corresponding increases in pH (up to 0.3 units).

In addition to creating a more hospitable environment for lactic acid bacteria (LAB), subsequent pH increases may secondarily affect bitartrate, color, protein, and microbiological stability. Upward changes in pH, combined with a reduction in free molecular sulfur dioxide, may increase a wine's potential for biological degradation.

Modification of low pH, high TA wines by malolactic fermentation broadens and lengthens the finish of certain wines, while possibly also adding flavor and complexity.

A ***PWV***-survey was conducted to determine wine industry practices and philosophies regarding the use of malolactic fermentation. Over 100 wineries participated in this national survey. The regional breakdown was as follows: California (98), Oregon (3), Washington (10), Michigan (4), New York (7), Pennsylvania (4), and Virginia (7).

Utilization/preparation of LAB starters

Winemakers utilizing MLF have two alternatives available to them: 1) reliance upon native 'in house' populations to develop and carry out the conversion, or 2) inoculation with ML starter cultures. Reliance on indigenous populations of LAB is unpredictable and among those wineries relying upon spontaneous growth of lactics, reported success is typically the result of processing protocol and intrinsic juice/wine chemistry which are conducive to growth of a single LAB strain at the exclusion of others.

By comparison, intentional induction of MLF has definite advantages. Aside from the obvious advantage of strain selection, the winemaker has greater control over the timing and course of LAB activity; thus minimizing the potential for stuck or sluggish MLF. Despite this, 10% of the respondents (that desire a MLF) reported that they did not intentionally induce MLF.

Significant decreases in viability (3 to 4 orders of magnitude) may be seen upon inoculation of LAB into wine.[32] The causative factors for the drop in population viability are likely due to the collective contributions of low pH, stressful high levels of alcohol, insufficient nutrients and potentially inhibitory levels of sulfur dioxide.

Inoculation of active LAB should include a period of acclimation to the wine or juice environment. Often winemakers use already active MLF wines to inoculate other lots. In these cases, relatively large volumes (5% to less than 15%) must be used as inoculum.[4] In some instances, winemakers may use LAB lees as inoculum. Aside from logistical problems, utilization of bacteria during or near the completion of MLF is risky because environmental stress has likely decreased their vigor. Hence, the potential for stuck or protracted MLF in recipient lot(s) is greatly increased.

A number of commercial dehydrated LAB cultures are available. Their advantage is that the lag time needed to prepare a sufficient volume of active starter is shortened significantly from that needed to bring up cultures maintained on laboratory media.

Among those wineries that used LAB inocula, 43% used freeze-dried preparations, 34% used liquid cultures, 8% used frozen concentrate, and 5% used laboratory cultures.

Due to the substantial mortality rate among LAB upon transfer to wine, most procedures for starter preparation include reactivation and incubation in a 'more friendly' expansion media prior to (and rather than) direct inoculation into wine. Reactivation/expansion protocol typically utilizes initial rehydration if necessary (*i.e.*, if dried culture) in sterile water followed by transfer to sterile grape or apple juice of various dilutions.

The survey asked those using freeze-dried cultures to describe their procedure for rehydration/reactivation. Rehydration in sterile water, followed by expansion into sterile dilute juice and subsequently to full strength juice, was employed by 29% of respondents. Rehydration in sterile distilled water prior to direct addition was employed by 25%. Rehydration in grape juice (presumably sterile) was employed by 17%, while 10% rehydrated in apple juice, 7% in actively fermenting grape juice, and 5% used a combination of grape and apple juice. Only 3% rehydrated directly into wine. Surprisingly, 5% did not rehydrate at all which may explain the poor success rate encountered by some.

With regard to the temperature and time of rehydration, most respondents (59%) use a temperature range of 70°-80°F (21°-27°C), 27% were in the range of 80°-90°F (27°-32°C), and 14% between 90°-100°F (32°-38°C). The time of rehydration ranged from less than 10 minutes (26%), to 10-20 minutes (54%), and 20-25 minutes (20%).

Because LAB are nutritionally demanding, having lost (through evolution and/or mutation) the ability to synthesize many specific compounds required for growth, they require a variety of preformed compounds. These include

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B-vitamins, amino acids, and even pyrimidine and purines.[22]

Wines differ in their ability to support growth of LAB. This is partly due to differences in available nutrients required by the particular lactic strain(s) present in the wine. Therefore, most formulations for reactivation/expansion utilize addition of one or more supplements. The literature reports various media for this purpose.[1]

Diammonium phosphate was added by 55% of the survey participants. Yeast extract was employed by 26%, and 19% used 'proprietary mixtures'. It should be noted that some feel that supplementation with diammonium phosphate (as a simple source of assimilable nitrogen) is of no value in LAB reactivation. Instead, they recommend addition of yeast extract and/or vitamin supplements.[11]

Since LAB are sensitive to sudden drops in pH, most respondents adjust the pH of rehydration/reactivation media prior to transfer. Wine pH is perhaps the most important parameter controlling the growth of lactic bacteria. The pH establishes whether lactics will grow in wine, which species will grow, their growth rates, and the concentration of metabolites produced during the growth cycle.

The pH of starter cultures was adjusted by 75% of survey participants. Adjustments were to: pH 3.4 - 3.6 (27%), 3.6 - 3.8 (38%), and 3.8 - 4.0 (26%) [probably the best]. Only 8% adjusted to 4.5 - 5.0 pH.

Since LAB are solely fermentative microorganisms, lacking the biochemical pathways of aerobic metabolism, they grow very slowly. Thus, pre-inoculation expansion of starters into sufficient volume for inoculation into wine typically takes several days or longer. Indeed, 50% of the winemakers indicated that culture expansion took more than four days, while 36% reported two to four days before the culture was ready. The expansion culture was added in less than two days by 14% of the respondents.

How do winemakers determine when expansion cultures are ready to use? The change in malic acid content is monitored by 53%, 25% followed cell number increase by microscopic examination, 19% followed increased turbidity, and 14% used paper chromatographic separation.

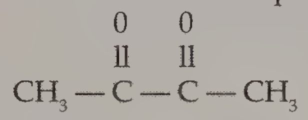
Since direct utilization of sugars is the energetically 'preferred' mode of growth and, conversion of malic to lactic acid is secondary, following progress of expansion cultures by changes in malic acid

Continued

NAME GAME

By Barry H. Gump, PhD. Dept. of Enology, Food Science & Nutrition, California State University, Fresno

Question #1, class: Please select the correct name for the compound:



$$CH_3-\overset{\overset{0}{\|}}{C}-\overset{\overset{0}{\|}}{C}-CH_3$$

Answers are:

a) biacetyl, b) diacetyl, c) 2,3-butanedione, d) all of the above, e) Gee, Doc, I don't know!

The second most popular answer is (d). Answers (a), (b) or (c) depend upon what dialect of the language of chemistry you speak.

There is a standard dialect, established by the International Union of Pure and Applied Chemistry (IUPAC). In the IUPAC system, the preferred name is 2,3-butanedione, reflecting the chemical structure of the molecule.

At the other extreme, we have what are called common names, often featuring some chemical property of the molecule. Biacetyl and diacetyl are accepted common names.

Few people who work with chemicals—including chemists—speak the pure IUPAC dialect, that is we all use 'water' and 'ammonia' rather than systematic names for those common compounds. So even chemists speak a mixture of common and systematic names.

Even though the 'preferred' name is 2,3-butanedione (and I'm told that IUPAC may change that to butane-2,3-dione within the next ten years), which of the common names is the better substitute?

One of my organic chemist friends prefers 'biacetyl,' since the molecule consists of two acetyl groups connected together. On the other hand, since there are *two* acetyl groups in the molecule, diacetyl is also correct. You find diacetyl used in the Merck index and in some of the German literature.

I visited the American Chemical Society's Chemical Abstract Service (CAS) office in Columbus, OH to discuss the question of biacetyl or diacetyl. CAS used biacetyl until 1957 when 'bi' names were replaced by Geneva (IUPAC system) names and 2,3-butanedione became the official CAS designation.

CAS still permits use of the common names, biacetyl and diacetyl (plus six others), among the 14,000,000 names it recognizes. However, CAS prefers the systematic 2,3-butanedione in its indexes.

As far as I can find, the only major reference work using the term diacetyl is the Merck Index. Consistent with some of the German literature, Merck lists our compound as diacetyl, then 2,3-butanedione, and third, biacetyl.

Now, let's get to what is really important about how we name this compound. If you look for it as 'biacetyl' in a number of common supply catalogues, you will not find it. Instead, you will find 'diacetyl (see 2,3-butanedione)', 'diacetyl (2,3-butanedione)', listed under both 'diacetyl' and '2,3-butanedione (diacetyl)', and finally as '2,3-butanedione' alone.

A technical service representative at one supply house said that they put their catalogue together in response to customer preference and common usage. He found biacetyl used only three times out of 400 recent citations.

A technical service representative at EM Science (Merck's chemical supply house) said essentially the same thing: "Biacetyl just isn't popular today," and their catalogue also lists chemicals in response to customer preference. (Incidentally, the EM Science catalogue only lists our compound as 2,3-butanedione).

So there you have it. You may call the compound 'bi' or 'di' or by '2,3-' and you are not incorrect. However, if you want to order the material as a laboratory standard, you will most likely have to use 'diacetyl' or more often '2,3-butanedione.'

While on the subject of scientific names and symbols, do you still use 'ml' as the symbol for milliliters, and the term 'extinction coefficient' in spectrophotometry? IUPAC has done it to you again! Currently the correct symbol is 'mL,' and the correct spectrophotometric term is 'absorptivity.' So get with it, clean up your act; 'chemistry' like other languages continues to change with time. ■

content is not as useful as direct microscopic examination.

Prior to use, it is necessary to create a high-titer (greater than 10^6 cells/mL) inoculum and expand the final volume of the starter to more than 1% of the final volume of the wine. The majority of respondents (58%), indicated that they inoculated with a 1% to 2% volume, whereas 26% used volumes greater than 2%. An inoculum of 0.5% was employed by 17%. The addition of 0.5% inoculum can be inadequate, frequently resulting in no MLF or very slow development.

After inoculation into wine, 45% of winemakers follow the progress of MLF in wine by paper chromatography, 17% use enzymatic malic acid assays, 12% use a combination of both methods, 8% follow progress visually, 8% microscopically, 7% listen for carbon dioxide evolution, and only 2% use HPLC (high performance liquid chromatography).

While paper chromatographic separation is adequate for routine monitoring of MLF progress, the limits of sensitivity for the method have been identified at 100 mg/L.[14] Gump, *et. al.*, report wines that have tested 'negative' for malic acid using paper chromatography, can undergo further MLF activity in the bottle.[10]

Improved sensitivity in the chromatographic procedure (to 30 - 50 mg/L levels of malic acid) are obtainable using procedures outlined in Zoecklein, *et. al.*[32] While this method improves lower-end sensitivity, potential unresolved malic acid is still above generally accepted 'safe' (<30 mg/L) levels for malic acid in wine. Hence, absence of a malic acid spot on a paper chromatogram is not evidence of completion.

With either method, verification should be made using a direct analysis of malic acid such as HPLC or enzymatic assay. 'Kits' for malic acid analysis are commercially available.[32] Of the winemakers in this survey, 66% consider malic acid levels of less than 15 mg/L as 'safe,' while the balance consider wines between 15 mg/L and 30 mg/L acceptable.

Synergistic and antagonistic effects between various strains of lactics as well as between yeast and lactics have been reported.[30,31] During fermentation, production of vitamins and amino acids by yeast is known to stimulate activity of LAB. Further, yeast autolysate makes available an additional pool of amino acids which may also serve to stimulate LAB.[3]

On the other hand, growth of some fermentative and/or spoilage yeast has also been shown to deplete arginine and other amino acids with subsequent impact on populations of *L. oenos*.[3] Repression of LAB activity resulting from production of sulfur dioxide by strains of wine yeasts during the course of fermentation has been documented.[8,18] Further, formation of potentially inhibitory levels of octanoic and decanoic acids by some wine yeasts also is inhibitory towards LAB.[6]

Over 75% of the winemakers did not believe that yeast strain impacted subsequent MLF. Among those that felt there was a relationship, 16% believed that yeast selection improved bacterial growth, while 9% felt certain strains potentially inhibit activity of LAB. Respondents using Prise de Mousse were 41%, with Montrachet, Epernay II, and Champagne comprising 16%, 14%, and 12%. Pasteur Red and Chanson represent 10% and 8%.

The majority (56%) had not observed

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any interaction between MLF and grape cultivar. Among the 44% who had noticed an effect, the majority felt that Pinot Noir underwent MLF faster than Cabernet Sauvignon.

Most (75%) winemakers do not distinguish between LAB strains for red and whites. Among those that do use different strains, the decision varies with the particular vintage.

Winemakers preferred the following individual LAB strains: 58% MCW (Matanzas Creek Winery), 15% ML-34, 11% Scott 'X-3', 10% Microlife Oenocup, and 7% PSU-1.

Products of MLF include acetic acid and acetaldehyde as well as biacetyl, acetoin, and 2,3-butanediol. Unfortunately, sensory changes brought about by MLF are often difficult to assess.

Winemakers often experience difficulty in discriminating between changes due to acid reduction versus those resulting from MLF. Pilone and Kunkee examined the sensory properties in two red varieties after MLF with six strains of LAB including *Lactobacillus*, *Leuconostoc* and *Pediococcus*.[20]

In sensory trials where pH of MLF lots was adjusted to the levels of controls (which had no MLF activity), the control lots were preferred. When asked to rank LAB lots with respect to preference, *Lactobacillus brevis* received the highest score. When *L. brevis* was compared with control lots using triangle difference techniques, the panel was not able to detect significant differences between them. Similar results are reported using three grape varieties (non *vinifera*) and *Leuconostoc oenos* (ML-34 and PSU-1).[2]

Only 51% of the winemakers indicated that they had not noticed differences between strains while 49% indicated that they had.

Biacetyl, a compound producing a distinct buttery character, is of interest to winemakers due to its ability to add apparent complexity. Depending upon the wine in question, levels at which biacetyl becomes perceptible and assertive range from 5 mg/L to 7 mg/L. At lower levels (5 ppm), complexity appears to be enhanced.[24,25] Formation of biacetyl varies with LAB species and with ***timing*** of MLF inoculation/activity.

Further, the relative concentrations of biacetyl, acetoin, and 2,3-butanediol are not static, changing during and after both alcoholic fermentation and MLF.[21] These researchers found that biacetyl and acetoin reached levels of 0.4 mg/L and 15.0 mg/L during alcoholic fermentation, dropping to 0 and 2 mg/L by the end. During MLF, which occurred after alcoholic fermentation was complete, biacetyl levels followed the same pattern, increasing and subsequently decreasing.

The survey asked if the winemakers analyzed for biacetyl. While current analyses of biacetyl are, unfortunately, not routine, results provide useful information of potential importance in processing and finishing considerations. Analytical methodology is presented in Zoecklein *et. al.*[32] Only 0.3% of the respondents indicated that they were currently analyzing for biacetyl in wine.

Red/White wines

Most survey participants utilize MLF for enhanced complexity and stylistic concerns (52% for reds, 60% for whites). Over ½ of respondents use MLF as a tool in adjusting pH and/or TA in reds, whereas in whites, 9% of winemakers

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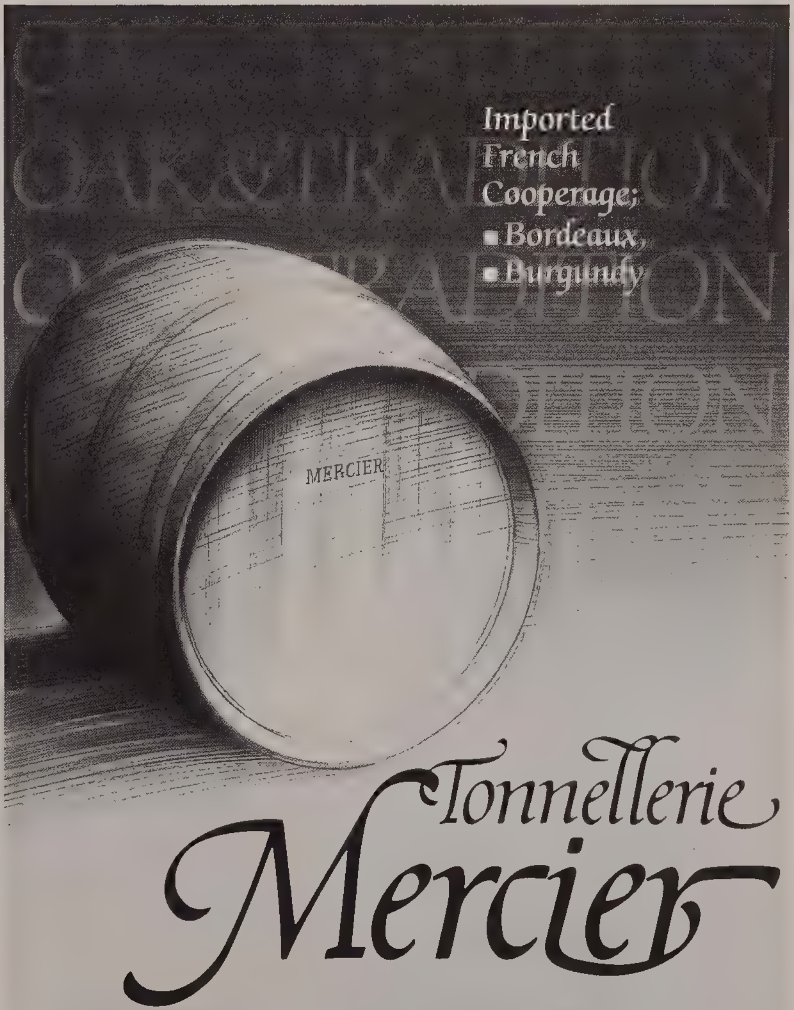

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use MLF to achieve this goal.

Unfortunately, 12% indicated that they still induce MLF for 'stability' reasons. The fact that wines may have undergone what the winemaker believes to be a 'successful MLF,' ***does not*** preclude the wine from subsequent growth of ***other*** wine microorganisms.

In the case of lactics, Vetsch and Mayer report secondary growth of *Pediococcus cerevisiae* upon completion of MLF in red wines.[29] As suggested by the growth of the spoilage lactics in their study, such problems typically are seen in high-pH wines. However, one cannot assume that wines at lower pH levels are 'immune' to secondary biological activity.

LAB are relatively sensitive to the effects of sulfur dioxide. It is generally accepted that levels of total sulfur dioxide above 50 mg/L and free levels of 10 to 30 mg/L are inhibitory to growth of LAB. However, this depends upon bacterial strain, viable cell number, their stage of growth, and other environmental parameters.

Although the issue of LAB strain susceptibility to sulfur dioxide has been examined and reported, generalities are not apparent.[7,12] In red wine processing, 55% of the winemakers do not add sulfur dioxide at crush, 18% add less than 30mg/L, 22% add 30 to 50 mg/L, and 5% add 50+ mg/L. Upon completion of MLF, the majority (66%) add 30 to 50 mg/L.

In white wine production, 66% add no sulfur dioxide pre-fermentation, 19% add less than 30 mg/L, and 15% add 30 to 50 mg/L. Upon completion of MLF, sulfur dioxide additions followed the same trend as seen in red wine production.

The majority (57%) of winemakers indicate that they adjust the TA of white and red must as needed, prior to fermentation. However, most (85%) do not consider the relative malate/tartrate in measurements of initial TA. Of those that do consider the malic acid concentration, only 6% do acid adjustments of red musts must using malic acid. For whites, 8% adjust using malic acid singly or as a component of the acidulation.

With regard to timing of bacterial inoculation, winemaker opinion varies, ranging from shortly after crushing (or pressing) to post-fermentation. The concern among winemakers over the addition of lactic cultures before the onset of alcoholic fermentation originally came from the French literature which suggested that the onset of alcoholic fermentation was delayed by the addition of *Leuconostoc oenos* at a cell density of 10^7 cells/mL.

Also, workers reported that during the resultant extended lag phase, unimpeded growth of lactics on sugars produced high levels of acetic and lactic acids. The American literature, however, has not generally supported these findings.

In reds, 41% of winemakers added LAB inocula during the course of fermentation, 17% at the end of alcoholic fermentation, and 17% after pressing at the end of extended maceration. Of this red wine group, 40% of the winemakers surveyed press after extended maceration, 39% at dryness, and 21% between 1° and 5° Brix.

In white winemaking, 24% inoculate with LAB (simultaneously) with yeasts at start of fermentation, 24% inoculate once the yeast population is established, and 48% during the course of fermentation (11% of the latter responses indicated addition when wine was at less than 5° Brix). Addition upon comple-

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tion of alcoholic fermentation but before first racking was done by 12%. Only 3% inoculated wines after first racking.

The time required for MLF completion is influenced by temperature. LAB are relatively temperature tolerant although their growth is stimulated at warm cellar conditions. Winemakers reported that MLF in red wines was carried out (38%) at 65°- 70°F (18°- 21°C), 30% at 70°- 75°F (21°- 24°C), 21% at 75°- 80°F (24°- 27°C), and 12% at temperatures above 80°F (27°C).

Winemakers carry out MLF in white wine at somewhat lower temperatures. MLF was conducted by 46% at 60°- 65°F (16°- 18°C), followed by 32% at 65°- 70°F (18°-21°C), 8% at 70°-75°F (21°-24°C). Surprisingly, 10% of the respondents indicated they carried out MLF at 55°- 60°F (13°-16°C). This is considerably below the optimum growth temperature 86°F (30°C) of most LAB's.

The majority (63%) of winemakers indicated the 'average' time for MLF in red and white wine ranged from 10 to 30 days.

The success rate for completion of MLF in red wine varied. Complete (100%) success with MLF was reported by 74%, 20% indicated 90% successful completion, and 5% reported 80% (or less) success. When problems were encountered, most (58%) attempt reinoculation.

Splash racking in reds is largely unsuccessful in stimulating LAB due to the microaerophilic/fermentative metabolism of these organisms. This is supported by the observation that 80% reported the technique to be ineffective.

Successful completion of MLF in white wines is considerably lower. Only 26% indicated complete conversion of malic to lactic acid, with 26% and 24% indicating 90% and 80% success respectively. Only 7% indicated success levels of less than 50%.

The differences in the completion rate between reds and whites may stem from differences in pH, primary (and MLF) fermentation temperature, and the enhanced growth promoters extracted from red wine grapeskins.

When MLF doesn't complete, winemakers indicated that they use sterile filtration to stabilize the wine (52% red) and (59% white). By comparison, 40% (red) and 37% (white) add sulfur dioxide, 3% add fumaric acid, and the balance use refrigeration.

Conclusions

Results of this survey generally support our introductory contention that the wine industry has evolved considerably in its understanding and utilization of MLF in processing. While we believe that the discussion and accompanying figures speak for themselves, several observations developed upon examination of survey results merit emphasis.

First, sensory attributes or deficiencies emerging from wines having undergone MLF are not only strain-related, but are critically dependent upon many interactive environmental pressures. These include wine chemistry, temperature, and presence (or absence) of other wine microorganisms, as well as their relative stages of growth.

As with any ecosystem, the resident microbial communities in fermenting/ageing wine are not static. Further, the activities of one species is generally intimately tied to those of others (yeast x bacteria, bacteria x bacteria, and yeast x yeast).

From an operational point of view, we still see significant numbers of winemakers inoculating at too low a cell titer. Fur-

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ther, some still feel that 'successful' MLF 'protects' the wine from further microbial activity, a conclusion which research and experience has shown to be false. ■

Acknowledgments

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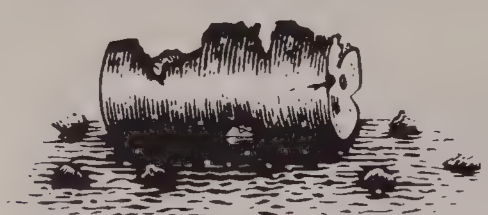

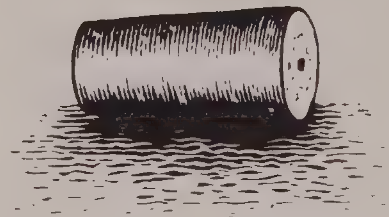

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PART II:

FOCUSED HIRING:

Successful sourcing and evaluation

**By Carolyn Silvestri,
The Personnel Perspective**

Part I of this series (**PWV**-March/April'93) introduced focused hiring as a recruitment process. It includes looking for people who not only possess desirable skills and experience but who also are compatible with your winery in regard to personality, work style, motivation, and career goals.

Multiple sources

Once you have determined exactly what you are looking for, the next step is to find good applicants who meet your criteria. This is best accomplished by utilizing multiple sources, such as local colleges and universities; newspaper advertisements; other companies within the wine/grape industry; employees, friends, and colleagues; job fairs and open houses; professional or special-interest groups; consultants/contract recruiters; and search firms and employment agencies.

By getting the word out through many or all of the above sources, you can increase your pool of potential applicants, which leads to better prospects. Generally, using multiple sources also helps to discover good applicants more quickly.

Evaluating resumes

More and more applicants are having their resumes professionally prepared, which makes using resumes as an evaluation tool more difficult: The 'best' resumes may no longer come from the 'best' applicants. Still, resumes can help identify those applicants that you want to interview.

To carefully evaluate a resume, ask the following questions:

- Does the resume indicate that the applicant has the key qualifications, characteristics, and experience that you've identified in your evaluation of the position?
- Has the applicant's experience and training been gained in an environment similar to your winery/vineyard?
- Has the individual had sufficient experience?
- Has the size of wineries the applicant has worked for impacted the actual experience the individual has had?
- Does the resume show accomplishments and results? If so, are they significant?

Remember, a resume only gives a partial picture of the applicant. When in doubt, it is worth the time to conduct an interview by phone before discounting someone as a viable candidate for the vacant position.

Evaluating application forms

Your own application form is an important tool in evaluating applicants. It solicits the information you want to know, rather than the information the applicant wants you to find out, which is the case with resumes.

In reviewing your application form, follow the same guidelines outlined for resumes. Also investigate other areas, such as:

- *How the person was referred to your winery.* This can give some clues about the applicant's motivation and approach to important tasks.
- *Information about the applicant's supervisor* — Who was the supervisor? What was the reporting relationship, and so on. This can help you better understand the applicant's previous experience with regard to work environment and relationships and determine the degree of similarity to the position you are trying to fill.
- *Reasons for leaving previous jobs* are very important factors to consider when evaluating an applicant. Do the reasons seem valid? Do they seem reasonable? Does the applicant list specific or vague

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reasons for leaving? Does the applicant have a history of leaving jobs every few years for 'better opportunities?' Remember, history tends to repeat itself, so look for patterns in prior employment.

- *Who the applicant lists as references* can be revealing about their professional relationships beyond past employers.

Phone screening: a time-saver

Because careful selection of the right person to fill a vacancy can be time-consuming, phone screening is one approach that can save a considerable amount of time if numerous applicants are being considered. Phone screening also can be delegated to someone else in the winery.

The normal in-person interview lasts from 30 to 60 minutes; an effective phone screening interview generally lasts 15 minutes. It can provide enough information to determine whether you want to further consider the applicant and set up an interview in person.

Prior to phone screening, develop a list of key questions that will help determine whether the person possesses the critical skills, experience, and qualities you seek. Possible phone screening questions might include:

- Please tell me about the five things that you do best.
- Why did you apply for this position?
- Why are you seeking new employment?
- What salary and work hours do you desire?
- What do you seek in your next position?

Find better applicants

These methods can help you find better job candidates and focus on interviewing the right applicants the first time.

Part three of this series will discuss legal issues in hiring. ■

Carolyn Silvestri is founder and owner of The Personnel Perspective, a human resources consulting, recruiting, and executive search firm, tel: 707/576-7653.

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PINOT NOIR —

Versatile varietal for food harmonies

By Eleanor & Ray Heald

"If you ask me which wine harmonizes with more foods than any other, I have to say Pinot Noir," contends Patricia Windisch, executive chef/owner of The Food and Wine Pairing Center, a catering company in St. Helena, CA.

"A sauteed salmon with Pinot Noir sauce is not only versatile, but simple to prepare," Windisch continues. "Pinot Noir is one of those wines that bridges white meats to red meats, poultry and chicken to seafood. I like it especially with salmon.

"Pinot Noir is sufficiently versatile as a picnic wine matching well with sauteed sausages and roast chicken. With Pinot, there's no butting heads with tannins. They're incredibly soft and fruity and saucing with them is a delight."

Windisch tasted through the Pinot Noirs selected for the varietal review (page 52) and divided them among the categories light and fruity, reserve character, oaky, and mature.

She chose the 1990 Bethel Heights Pinot Noir as the fruitiest of the lot and based her comments on fruity Pinots with this wine in focus.

"Its bright fruit harmonizes easily with sauteed sausages," she says. "Adding dried cherries or other dried fruit to the sausage meat will balance the wine's fruitiness in the mouth. The more I tasted it, the more I think a duck sausage matches best. When sauteed, the sausage fat and texture plays off the wine's youthful fruit and palate-cleansing capability."

Windisch cautions that too much fruit in a food preparation reduces some of the wine's natural, youthful fruitiness. She offers her duck sausage preparation with confit spice to pair with a fruity Pinot Noir.

Duck Sausage

2 lbs. duck breast meat
1 lb. pork fatback
6 shallots, peeled
2 large cloves of garlic, peeled
1 Tablespoon, plus 2 Teaspoons confit spice (recipe follows)
1 Tablespoon salt
½ teaspoon freshly ground black pepper
1 teaspoon Herbes de Provence with Lavender
¼ teaspoon Cayenne Pepper
1 Tablespoon chopped fresh Chervil
½ cup duck or veal demi-glace
2 Tablespoons Madeira
2 Tablespoons cognac
2 Tablespoons Armagnac
1 Tablespoon dry Sherry

Grind duck breast meat and pork fatback through the large holes of a meat grinder. Put one-half of the mixture through the grinder a second time. Also, put shallots and garlic through the grinder twice. Add the remaining ingredients and stir to emulsify.

Stuff into large hog casings and leave to blend flavors 12 to 24 hours. Poach sausages in a water bath until the juices run clear in the casings. Remove from poaching liquid and cool, and if possible, refrigerate. When ready to serve, remove casings and saute in clarified butter to brown slightly.

Confit Spice

1½ teaspoon ground cumin, coriander, and cinnamon
1 teaspoon allspice
½ teaspoon ground cloves
½ teaspoon caramom
¾ teaspoon ground ginger
½ teaspoon ground nutmeg
2 bay leaves, crumbled
¾ teaspoon fine powdered thyme
Combine all ingredients

Playing on the picnic aspect of lighter, fruitier Pinots, Windisch suggests gourmet, vegetarian pizzas with light-handed use of fresh tomato sauce, not cooked or canned. She has noticed that artichokes are frequently used in preparing this style pizza and cautions against their use. "If there's one vegetable that does not pair with wine, it's artichokes," she maintains.

She placed the 1990 Dehlinger Pinot Noir as a style between the lighter, fruitier Bethel Heights and a bigger reserve style. "The Dehlinger will pair well with the same food complements as the Bethel Heights, but its intensity allows you to play on the fruit a bit more," she advises. "Everything will work well if you tie the sauce to it."

She suggests pan steaming or pan sauteing an inch-thick salmon steak for an ideal match with a sauce created from shallots, thyme, bay leaf, and the wine. Near the end of the sauce reduction, she adds some cream and emulsifies it with butter.

For an example of matching food preparations with a bigger, reserve-style Pinot Noir, Windisch turned to the 1990 Robert Mondavi Winery Reserve. "Lamb is my immediate first impression," she confirms. "The wine's nose is more complex with other-than-fruit elements.

"I know that people want to put lamb and Cabernet Sauvignon together because flavors are tied to the fat content. But when I prepare lamb, I strip the fat away and it then pairs well with Pinot Noir."

Because a reserve Pinot Noir is sturdier, spicier, and longer-lasting on the palate than a fruitier version, Windisch targets the spice elements in a lamb preparation. She prefers Arabic spices such as nutmeg, cinnamon, and mace. When subtly used, she believes they contrast with the toastier oak showcased in most reserve styles.

Windisch prefers not to grill the lamb over wood because the wood elements, incorporating with the meat during cooking, overpower the delicate oaky elements from barrel ageing the wine.

"Roasting or pan sauteing lamb with a reserve Pinot is my definite preference," she details. "The minute you grill anything, you're imparting the flavor of whatever wood you cook with. This is also true if you use a charcoal grill. Grilling can be dangerous to wine flavors, yet you see restaurants relying on the grill for most every dish."

Remaining focused on reserves, Windisch sampled the 1990 Saintsbury Reserve and remarked about its richness. She discovered plums, bing cherries, and a slight pepperiness in the nose that was well-mirrored on the palate.

"The incredibly full palate fruit expression of this wine is not evident in the nose," she remarks. "Because so much of the wine's impact is not revealed until it's tasted, it should be

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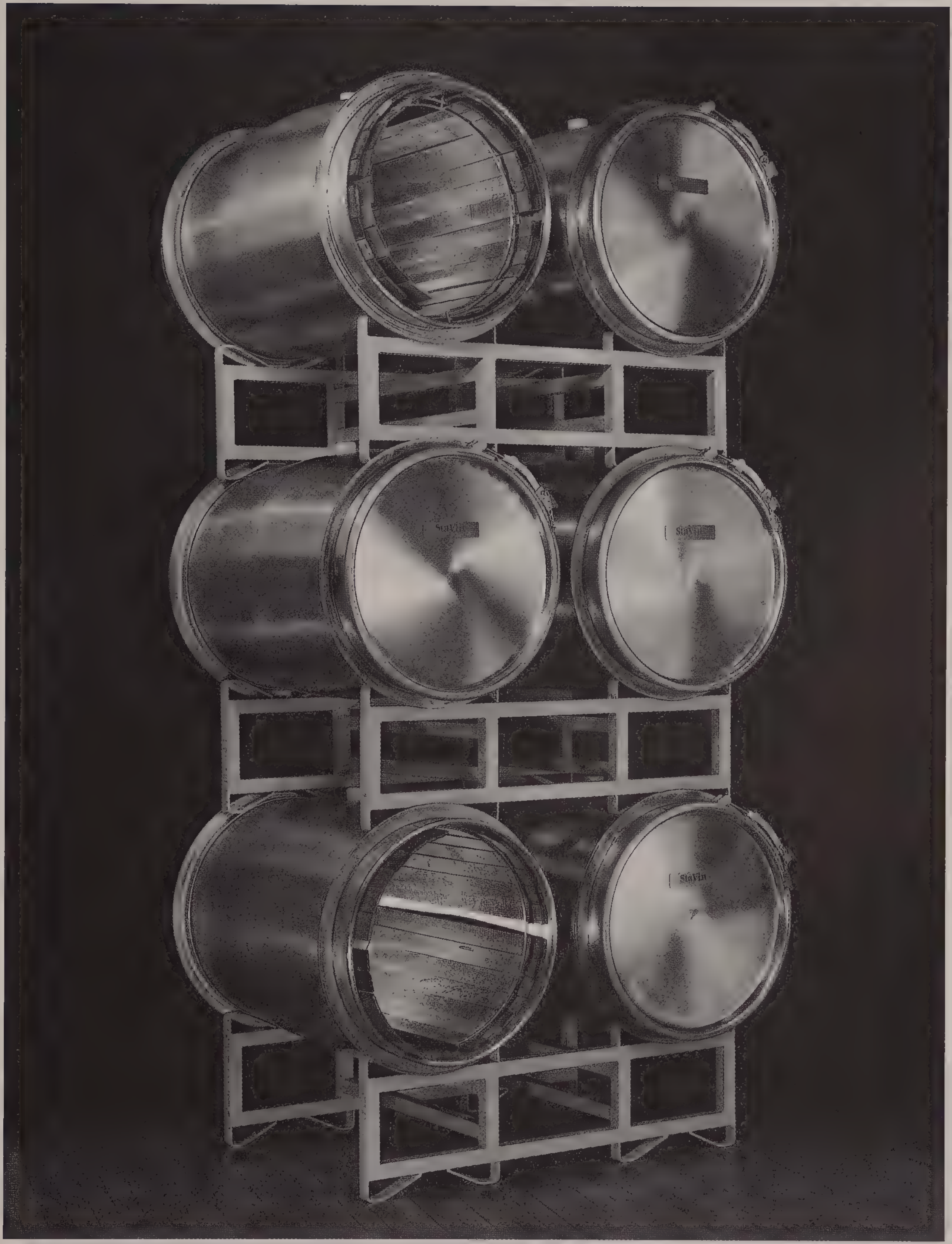

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matched with an old-fashioned slow-cooked meal such as braised rabbit or chicken fricassee. The richness of a braising or fricassee sauce will only serve to showcase the wine's overall richness which is its charm."

With the slow cooking method, Windisch would incorporate veal stock, a combination of fresh and dried apricots, Pinot Noir, and rosemary as the predominant herb.

With a rich Pinot Noir, Windisch also suggests duck breast with sun-dried cherry sauce.

The 1990 Sanford became Windisch's model to discuss an oakier version of Pinot Noir. She picked up on the toastier, charred oak qualities impacting the fruit flavors. She also perceived dried rose petal aromas. "Roasted red peppers come to mind as a perfect match," she reflects while closing her eyes and taking another smell. "I try to shut off as many of my senses as possible when I taste and attempt to create food harmonies."

A sampling of roasted red peppers with the 1990 Sanford Pinot Noir proved Windisch's instincts correct. The wine's fruit elements became increasingly highlighted in the finish, once pairing with the peppers was experienced. Without food, the oaky characters dominated the overall palate impression and finish.

To discuss harmonies with a more mature Pinot Noir, Windisch chose the 1987 Robert Mondavi Winery bottling. Blackberry and currants were evident in the aroma and flavors with significant tannins in the finish.

"If you don't like tannins in a wine, a high acid dish would take away the tannic edge," Windisch maintains. "It's a balance that tends to soften the wine. Goat cheese fits the bill in this regard. Also a black olive, capers, and sun-dried tomato tapinade dressing a piece of lamb or chicken would pair well."

Windisch maintains that more mature Pinot Noirs give a sturdier impression and can therefore be harmonized with some of the same foods chosen for oakier, but younger Pinot Noirs. "The range of foods is much wider for fruitier Pinot Noirs than it is for oakier or more mature wines," she concludes. ■

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Waste not — or perish!

By Dan Wilson, General Manager, The Wine House, Los Angeles, CA

The oldest baby boomers, those born right after World War II, remember gassing up their high school jalopy at $.28/gallon. Today, the taxes on gasoline are more than that. When gas was cheap, the public would buy cars that guzzled gas and only moved eight miles or so per gallon.

Today, when a tank of gas can wipe out a $20 bill, car manufacturers are forced to create cars that show more respect for gasoline.

This change parallels a change in the way businesses are run. Once upon a time, office staff, like gasoline, was considered cheap labor. The most expensive piece of office machinery was a manual typewriter. Documents were copied with carbon paper, not sophisticated electronic mega-gadgets. Hiring people to shuffle paper required minimal investment.

Today, the cost of health insurance and social security alone are enough to make an employer think twice about hiring additional staff. Unfortunately, many businesses still are designed around the concept of cheap help, and many of these businesses sell wine.

The cost of doing business the old-fashioned way already has destroyed many businesses. Pause for a moment to recall a few vanished merchants and wholesalers and you rightfully may feel a sense of urgency about this subject.

This point cannot be stressed enough: The remaining survivors must be attentive to the question of efficiency, both within their organizations and at the point of interface with their customers and vendors.

Besides being attentive, they must be concerned. The owner of a prestigious Napa Valley winery called on me at The Wine House recently. I described to him the expense I incur when I handle bottles that lack bar codes (UPC codes). He huffed a bit and said, in effect, "Shucks, what can it cost you to handle a few bottles like mine?"

I restrained myself from pointing out that he provided me with a strong incentive to handle as few of his bottles as possible. I also resisted the desire to point out that the customer, in our store, at least, is always right. Clearly his winery did not share this policy. If I insist that bar codes help my business, it is in his best interest to try to understand my point of view.

Presently, our retail store does not scan, but the expense of not scanning is painfully clear to me. We will begin scanning this year.

Standardize to streamline

The most costly part of business today is at the point of contact between companies. Both paper and phone calls move laboriously from one company to another. Many of these transactions could be streamlined. A great deal of money could be saved with a relatively small effort provided the wine industry would cooperate with some simple changes.

Let me first offer an example of the problem. During last Christmas season, I checked in 154 cases of wine delivered by Zephyr, a company that stores and ships wine in Southern California. The 154 cases were accompanied by eight documents, one from each of the wineries included in the order.

One cannot appreciate the differences in design and detail of invoices until you sort through eight of them under severe time pressure. Are products listed alphabetically or in a sequence that means something to the distributor/winery and no one else?

Are prices printed on the document or is it merely a packing slip? If they are not, how does the store verify that the prices actually billed match the prices quoted orally by the salesperson? Should the store assume their understanding of the price and begin selling the merchandise or hold it at their expense until the invoice arrives to confirm the selling price? Waiting costs a lot of money. So does selling at the wrong price and quarreling about who owes whom for the difference.

If you are an influential manager with a winery or distributorship, I invite you to call me to arrange a first-hand look at the receiving process. You might be startled by the amount of confusion built into the system by the diversity of invoice designs.

Let's turn to another area of concern. We publish a 32-page price book which we mail to 24,000 consumers who are interested in buying wine. We have more readers in California than the *The Wine Spectator*. We like to reproduce labels to accompany articles we publish describing individual wines. How many labels or stats do we receive from wineries to support our efforts? In my first six months at this job, I have received el goose egg royale, nada, zilch. You get the idea.

The irony is that many people spend travel dollars to visit the store and ask me what they can do for us. I'll tell you right now: You can lower our production costs on the price book by eliminating my need to phone you when your sales representative sells us a new release. Communication between your winery and our retail store is too expensive for both of us. Let's design a system that makes communication and administration affordable.

Solutions

Based on my past experience of preaching on the subject of economy and efficiency, I expect that my readers (if any, by this point) are reacting in one of three ways:

1) You think I'm crazy.

2) You tend to agree, but you think it is someone else's problem, not yours.

3) You really want to absorb this and do something to make your winery easier to do business with.

For those of you choosing option #3, I continue:

Remember when Apple computers couldn't communicate with IBM computers? Each thought they would 'win' and drive the other out of business. This kind of egomania often breaks down under pressure from the customer. Now it is possible to buy interface devices to connect the two brands of machine so they communicate with each other.

It is time for wineries to recognize that diversity in the realm of administrative tasks is a weakness, not a strength. Wineries must begin to agree on what invoices look like and what software to use on their computers. Creating agreement takes time, and it happens only when the need for consensus gets time on agendas at gatherings. It must become a priority at conferences and seminars.

The large companies, much like IBM and Apple, often feel immune to the need to standardize. The smaller com-

Continued on page 72

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Many years ago, Volclay KWK® food grade bentonite was developed in conjunction with and specifically for, the wine and fruit juice industries.

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As a true colloid, Volclay KWK® Food Grade bentonite has a surface area measured in square miles per pound when fully dispersed, and particles of Volclay KWK® have a uniform negative surface charge.

This unique natural product is able to attract, bond with, and precipitate out positively-charged proteins and other colloids in wine and fruit juice. These precipitated solids are then easily removed via settling, filtration, or centrifugation.

While adhering to the proposed specifications in the Food Chemicals Codex, KWK® Food Grade is produced as either its traditional granular form as easy and quick dispersing Agglomerated KWK® or new Volclay KWK®-200.

For additional technical information or for the distributor nearest you, contact: the Industrial Chemical Division of **American Colloid Company**, 1500 W.Shure Dr., Arlington Heights, IL 60004, tel: 708/392-4600, fax: 708/506-6199.

Please see our ad, page 9.

Cellulo Company

Several types of filter media, fining agents, and Novo enzymes are available through Cellulo.

Filter sheet media – Cellulo is the largest United States manufacturer of filter sheet media and offers the most complete grade selection available for filter press filtrations. We have been supplying the wine industry since 1919. In addition to flat stock filter sheet media, Cellulo also manufactures Cellu-Stack® disk pack filters and filter housings. Cellu-Stack® filters are a fast and convenient way to use filter sheet media.

Filter fiber – Cellu-Flo® filter fiber is manufactured in both wood pulp and cotton and in a variety of fiber length distributions to cover a wide spectrum of applications from lees to pressure leaf filtrations. Positive-charged cotton filter fiber offers the best membrane protection for pre-membrane pressure leaf filtrations.

Novoferm 12 – Novo Nordisk Bioindustrials has recently developed another enzyme for premium wine production. Novoferm 12 is a betagluco-sidase enzyme that hydrolyzes terpenyl-glycosides. By freeing these bound terpenes, the varietal aroma of wines produced from grapes such as Riesling, Muscat, and Gewurztraminer may be significantly enhanced.

Kolorfine® is a proprietary casein product widely used to correct and stabilize color in wine and juice. Drifine® is a pre-hydrolyzed, highly refined form of isinglass which is easily rehydrated with cold water in 30 minutes. Colloidal silica (keiselsol) is a colloidal dispersion of nanometer-sized silicon dioxide particles with a tremendously large reactive surface area that is used for clarification, improved filterability and compaction of lees. Other types of fining agents and technical support are available.

For more information, contact: **Cellulo Company**, 2949 E.Townsend Ave., Fresno, CA 93721, tel: 209/485-2692, fax: 209/485-4254 OR 27 N. Ave East, Cranford, NJ 07016, tel: 908/272-9400, fax: 908/272-8735.

Please see our ad, page 41.

Gist-brocades

Yeast – Gist-brocades continues to offer unique yeast cultures to the wine industry. In 1991, Gist-brocades introduced Fermirouge® and Fermiblanc® yeast cultures to provide the winemaker with an alternative to the basic yeast strains which have been the landmark of wine fermentations.

Fermirouge® has achieved popularity based upon its ability to improve the aromatic characteristics of red wine varieties, while producing a more subtle, smoother wine.

Fermiblanc®, selected specifically for aromatic expression in white wines, has been used to provide the fruity note which many winemakers desire in their white wines.

Both Fermirouge® and Fermiblanc® contribute that special flavor profile that sets your wine apart.

Fermivin, popular around the world because of its ability to provide a quick, vigorous fermentation, maintains the unique quality characteristics of the wine.

Enzymes – Gist-brocades is expanding the introduction of its new Rapidase Vino and Vino Super enzyme product line. Rapidase Vino and Vino Super were developed especially for the unique requirements of the wine industry.

Based upon the limited introduction of these enzymes in 1992, it was found that Rapidase Vino and Vino Super truly provide a specialized pectic enzyme blend that offers a rapid, distinct clarification profile while maintaining excellent pressabilities and juice yields.

Gist-brocades continues to demonstrate its innovations in biotechnology with its new Rapidase Vino and Vino Super enzyme products.

For more information, contact: **Gist-brocades**, 2200 Renaissance Blvd., King of Prussia, PA 19406, tel: 215/272-4040, 800/662-4478.

Please see our ad, page 51.

Great Western Chemical Co.

Enzymes manufactured by Genencor International, Inc.; PVPP produced by ISP Corporation; KWK bentonite; colloidal silica (Klebosol) and other wine treating materials are available from Great Western Chemical Co.

For more information, contact: **Great Western Chemical Co.**, 3595 E.Wawona Ave., Fresno, CA 93725, tel: 209/485-4150, fax: 209/485-0605; OR call: Richmond, CA 510/235-4810, fax: 510/235-5163; Santa Rosa, CA 707/526-2324, fax: 707/526-3961; Stockton, CA 209/982-5781, fax: 209/982-5370; Bakersfield, CA 805/392-1101, fax: 805/392-8625; Arleta, CA 818/771-0051, fax: 818/771-0058; Milpitas, CA 408/262-2830, fax: 408/262-3794; San Diego, CA 619/271-7911, fax: 619/271-7909; Santa Fe Springs, CA 310/944-9902, fax: 310/944-9395.

Please see our ad on page 24.

KLR Machines, Inc.

The specialized fining agent, isinglass, produced by SIHA in Germany, is available from KLR Machines. Isinglass, a natural fining agent from fish bladders is sold in the form of dried sheets. The active compound of this fining agent is collagen, a proteinaceous material with high molecular weight and excellent precipitation characteristics. Collagen in wine has a very strong positive charge, and therefore leads to the flocculation of relatively large particles.

The dried SIHA isinglass has a long shelf-life if kept in cool, dry, odor-free storage. Preparation for use involves swelling the dried SIHA isinglass in water, draining the water and transferring the SIHA isinglass to a small amount of high acid, sulfited wine. When the sheets become clear and gelatinous, this wine solution is vigorously mixed to uniformly dissolve the SIHA isinglass. This solution can be used immediately or stored six to ten weeks if it has 100 ppm free SO_2 at 50°F or cooler.

For more information, contact: **KLR Machines, Inc.**, 350 Morris St.#E, Sebastopol, CA 95472, tel: 707/823-2883, fax: 707/823-6954 OR 47 W.Steuben St., Bath, NY 14810; tel: 607/776-4193, fax: 607/776-9044.

Please see our ad, page 8.

Pickering Winery Supply

Pickering Winery Supply offers MiTech's advanced malolactic fermentation products and yeasts. MiTech's goal is to apply biotechnology to improve the biochemical or physiological characteristics of microorganisms that are critical to wine production.

44-40 and 54-40 Malolactic Cultures

The 44-40 bacterium combines the desirable metabolic and organoleptic characteristics of the Leuconostoc species, with the robust growth and stress-tolerant characteristics of the Pediococcus species, without retaining any of the undesirable off-flavors or aromas often associated with Pediococcus.

44-40 is a direct-inoculum malolactic culture which is extremely easy to use. No special equipment or training is required. Each package of the culture is premeasured to provide sufficient active bacteria for the volume of wine to be fermented. Simply resuspend the culture according to the directions and pour it into the wine.

54-40 Malolactic Culture is for wines that are especially resistant to induction of ML-fermentation. This high-density inoculum of 44-40 bacterium provides a minimum of 20 million cells per ml of inoculated wine. The basis of the technology is a proprietary reactivation and expansion medium which allows ultra high-density ML cultures to be produced by winery personnel in two to three days.

MI-8 and MI-16 Yeasts

MiTech has developed several new technologies for the commercial production and preservation of genetically superior wine yeasts. These high-technology cultures significantly enhance wine quality and consistency, and provide a new level of biotechnology control to the wine industry.

MI-8 yeast produces high quantities of deep, rich aromatics associated with Burgundian grape varieties such as Chardonnay and Pinot Noir. This strain is especially vigorous and can be used to restart stuck fermentations.

MI-16 is an excellent all-purpose yeast that produces large amounts of complex and appealing aromatics. It has excellent cold and heat tolerance and is genetically deficient in the biochemical pathway that produces hydrogen disulfide. Recommended for all red and white grape varieties except Riesling.

For more information, contact: **Pickering Winery Supply**, 888 Post St., San Francisco, CA 94109, tel: 415/474-1588.

Please see our ad, page 63.

Scott Laboratories, Inc.

Scott Labs offers a wide variety of processing aids for juice and wine. These include enzymes, yeasts, malolactic bacteria, fining agents, and filter media. Scott's staff also includes sales and technical personnel with degrees in winemaking and food technology.

For enzymes, Scott Labs offers a variety of enzymes manufactured by Rohm GmbH of Darmstadt, Germany. The Rohm product line includes specific products for particular needs such as mold-damaged grapes, blush wines, and hard press wines. During the harvest, inventories are kept in multiple locations to guarantee prompt service.

Scott has worked together with the yeast firm Lallemand for 20 years. In 1973, we began marketing two wine active-dry yeasts. Over 20 strains are now offered and more are being developed. Current strains include: EC-1118 (Prise de Mousse), 71B and 2056 (for aromatic results), Steinberger, K-1, and more.

Scott/Lallemand offers different malolactic strains: the OSU, the Inobacter, and X-3.

Sparkalloid was introduced by Scott Labs in the early 1950's. It continues to be a popular fining agent for hard-to-clarify wines.

Scott Labs offers filtration media from Seitz-Filter-Werke in Germany. Seitz materials range from depth filters (including the EK), to pre-membrane filters to polysulfone membrane cartridges. Large inventories are held at all times in Scott's Petaluma, CA warehouse. Scott can die-cut depth filters on premises, if the need arises.

For more information, contact: **Scott Laboratories, Inc.**, 2220 Pine View Way, Petaluma, CA 94955, tel: 707/765-6666, fax: 707/765-6674.

Please see our ad, pages 43,73.75.

Vinquiry

Vinquiry offers the Enoferm line of specialty yeasts, giving winemakers new choices in active-dry yeast for premium wine production.

The Enoferm strains were selected from wine-producing regions around the world on the basis of favorable sensory contributions and fermentation characteristics. Production-lot and small-scale evaluations were conducted in California during the past two vintages which demonstrated their advantages under a range of winemaking conditions. Seven Enoferm strains are available: Assmanshausen, Avize, Bordeaux Red, Burgundy, ICV D-47, M-2, Simi White (French White), and L-2226. Vinquiry continues to carry a wide range of other yeast, both as active-dry and slant cultures.

Malolactic fermentation is also a priority at Vinquiry. Several selections of bacteria are available to assure timely completion of this fermentation. The MCW strain, which was isolated and developed by Vinquiry, is widely used. Its vigorous growth, pH tolerance, and beneficial sensory characteristics have made it the bacterial strain of choice for a variety of wine types. MCW is available as a liquid or freeze-dried culture.

To expand available choices for malolactic fermentation, Vinquiry recently introduced Vino brand freeze-dried bacteria. Vino is made up of three strains of Leuconostoc which are both pH- and cold-tolerant. ML-34, the classic UC-Davis isolate, is available as a liquid culture.

Several types of nutrients are available to support growth of both yeast and malolactic bacteria: DAP (diammonium phosphate), yeast autolysate, yeast extract, yeast hulls, Fermaid, Cerevit (B vitamins), and Oenovit (nutrients for ML starters).

Vinquiry staff can help match the winemaker's needs with appropriate yeast and malolactic bacteria choices and discuss proper handling of the cultures.

For more information, contact: **Vinquiry**, 16003 Healdsburg Ave., Healdsburg, CA 95448, tel: 707/433-8869, fax: 707/433-2927.

Please see ad, page 60.

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CORK:
A Portuguese perspective

By Antonio de Barros
Amorim & Irmaos, Portugal

I have been involved with cork for the last 25 years. Out of a long list of problems, I have chosen to discuss those I think are either genuine concerns of all of us or exacerbated comments by some of the almighty media world-wide, who have, on occasion, misquoted the findings of the scholars and been less accurate than we would have expected.

The four most important problems are:
1) cork taint;
2) limited availability of quality cork;
3) diseases spreading in the cork forest;
4) difficult access to wine in the bottle.

There are common grounds to both the wine and cork industry. Cork is an agricultural product. Like the vineyards, the cork oaks are cultivated and cared for. Cork is harvested from the oaks and undergoes a number of operations before it is ready to be cut into corks.

At those stages, the technology, if any, relies on traditional practices that could, at times, shock the outsider and raise doubts as to whether any product can be produced from it that is not contaminated and prone to taint the wine it will be in contact with.

However, much like the must in winemaking, cork can be processed further to become inert, if this is what the wine industry requires.

Cork taint is indeed one of the most serious problems which, unfortunately, the cork industry was slow to acknowledge and perceive, mostly because it was not stimulated to react. But the moment it gained awareness of the taint existence, it was quick to respond and I think we are now in the process of resolving it.

Photo courtesy of: Cork Associates

Unable to intervene and correct at the early stages of the preparation of the corkwood, we have chosen to implement new technologies during the manufacturing process through:

a) accurate selection of the raw material;

b) development of new bleaching processes from which the chlorine element has been removed;

c) creation of new equipment for the application of physical principles in the process that further enhance the results already obtained;

d) development and application of surface coatings that improve the functional characteristics of wine corks;

e) implementation of quality control procedures at the critical areas of the production process.

But if these measures have contributed to reducing the problems, I think that better results will be obtained when the cork industry establishes a direct dialogue with the wine industry. It is important that cork technicians understand how winemaking evolves and what winemakers expect a wine cork not to do. It is also necessary that wineries correct some misunderstandings about how to use corks.

Quality cork

The cork industry is hoping to reach a better control of what happens in the cork forest and at the early stages of the preparation of the corkwood.

A task force from the Portugese Direccao Geral das Florestas (National Forest Institute) is already working with the Cork Industry Association and the European Community CE Liege in programs of education. They are setting rules and parameters that are gradually being enforced, which will have a positive impact on the final performance of wine corks.

I feel confident that the time will come soon when even the most frustrated detractors of cork will have to recognize that the industry was able to resolve the problems.

On occasion, many detractors have explored the notion that — to quote one — "there is not enough cork available to produce quality corks."

By definition, a quality cork is one that:

a) does not pose mechanical problems at the bottling plant;

b) offers an efficient seal;

c) keeps the wine at its best, until it reaches the consumer;

d) offers an easy pull and access to the wine.

Please be assured that there is enough cork in Portugal and reserves in the world to produce quality wine corks for an industry that, most unfortunately, is not growing. In fact, quite the opposite. Both wine production and consumption have decreased in recent years in the USA, reflecting a much more serious trend in Europe and in most wine-producing countries worldwide.

In fact, from the peak in 1979 of 378 million hectolitres, the world's wine production steadily dropped to 300 million in 1989. The word is that the world drinks less wine, but better quality wines. This might be the case in the USA, but let me assure you that it is not so anywhere in Europe where wine drinking used to be a part of the traditional diet.

Therefore, if more wine is not being bottled with cork (quite the opposite, unfortunately) whatever else could back up the claim of lack of quality cork?

Many contend that the 1974 revolution in Portugal has ruined the quality of the cork since the cork forests were taken by the communist cooperatives. Even, if indeed, the abuses and lack of care in the early years have had an impact on the quality of the cork, it is also true that the anomalies have been corrected since. Over 97% of the cork forests are back in private hands, who promptly corrected the problems they inherited.

Cork and disease

This leads me to the debate regarding the pretended diseases spreading in the cork forest. Not everything is right and action already has been taken to apply corrective measures in the forest areas that have shown abnormal mortality rates. This is due mostly to pollution coming from the nearby industrial complex of Sines, south of Lisbon.

But the problem definitely has been overemphasized and I am afraid I am in some way responsible for this. In fact, in April 1990 I read the article "an epitaph for the oak," published by ***Wine & Spirits*** magazine. I phoned the National Forest Institute and requested all the information available on the "aphydeo" *Primaprilia Americana*, that supposedly was responsible for a selective killing of the cork oak.

I went a step further and called a scientist at the National Institute of Entomology and asked him if he had ever heard of the 'little animal.' He had not — he would check with his colleagues in the USA and United Kingdom. When the answer came from the British Museum of Entomology that it was an April Fool's joke in bad taste (Primaprilia = the first of April), it was too late for me to stop the storm I had originated at the National Forest Institute.

Discussions among various governmental organizations further compounded the problem and information was made public that made the world believe cork was on its way to extinction. It was fortunate and timely that the National Forest Institute made public, early in 1992, the results of the census completed in November 1991.

According to the census, that showed the age of the cork forest based on measurement of the circumference of the trees, the category of young in transition to adult was 72.3%. The adult category accounts for 16.1%; the two categories combined total 88.4% of the existing forest.

By this criteria, the report concludes that the statements to the effect that the forest is decaying are baseless. The rate of mortality was scaled in five grades of frequency through the relation between the number of dead trees to the total number of trees in a given area. Eighty-

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five percent of the field stations reported no mortality in their territories. Of the 15% reporting mortality, 12% fall in a frequency ranging from 0.01 to 0.1, which clearly demonstrates that the mortality shows no signs of increase.

Not everything in the report was roses, but the fact that the census took place and that the authorities are fully aware of the condition of the forest is reassuring.

In addition, the PAC (Policy of Communion Agriculture of the EC), has imposed on Portugal to drop her traditional and, at times, obsolete agriculture to concentrate on reforestation, namely of the cork oak for the preservation of the European Ecosystem. This will cause currently non-productive areas to be reforested and an increased density in the existing producing areas.

An unpleasant barrier

The last topic — how cork is depicted as an unpleasant, old-fashioned barrier between the consumer and the product — has not been resolved for a few reasons.

First, it is not quite evident that all the customer has to do to have access to the product created with winemakers' imagination, knowledge, effort and pain — so much of yourselves is a "roll-on/roll-off," pilfer-proof device. This entails two notions:

a) that the expectancy of the consumer is non-existent,

b) that you have to protect your product against pilfering.

I am sure winemakers are not looking forward to the first notion. As for the second notion, although it would be flattering that anyone would risk prison because of your wine, we are all grateful that that is extremely unlikely.

The other aspects are cultural and a bit painful for me to elaborate on. Wine critics often seem to forget that the wine industry has its code and, unlike beer or spirits, lives from its unique and specialized identity. The cork you choose is indeed your signature. We hope we are the artisans who carve it to your requirements. What we are discussing here is how to make sure it really endorses your wine.

A long-lasting tradition

The marriage of wine and cork hopefully will be a long-lasting one, in line with the tradition that has resisted the erosion of its detractors.

I believe that the cork industry has gone a long way to cope with the pace of the wine industry and the changing habits of the consumer market. It is responding willingly to the challenges it has been confronted with in recent times. We shall continue to do our best to satisfy you.

Also, the new generation of cork brokers in the USA have to be praised for their unprecedented idea of creating the Cork Quality Council (CQC), in support of the product they represent, in response to your needs, and in challenge to the many attacks cork has been subject to. It requires a lot of courage and the genuine belief that by doing so, they are going a step further in their mission of serving the wine industry in the USA. ■

(Edited from presentation given in Napa, CA, January 1993, sponsored by the Cork Quality Council.)

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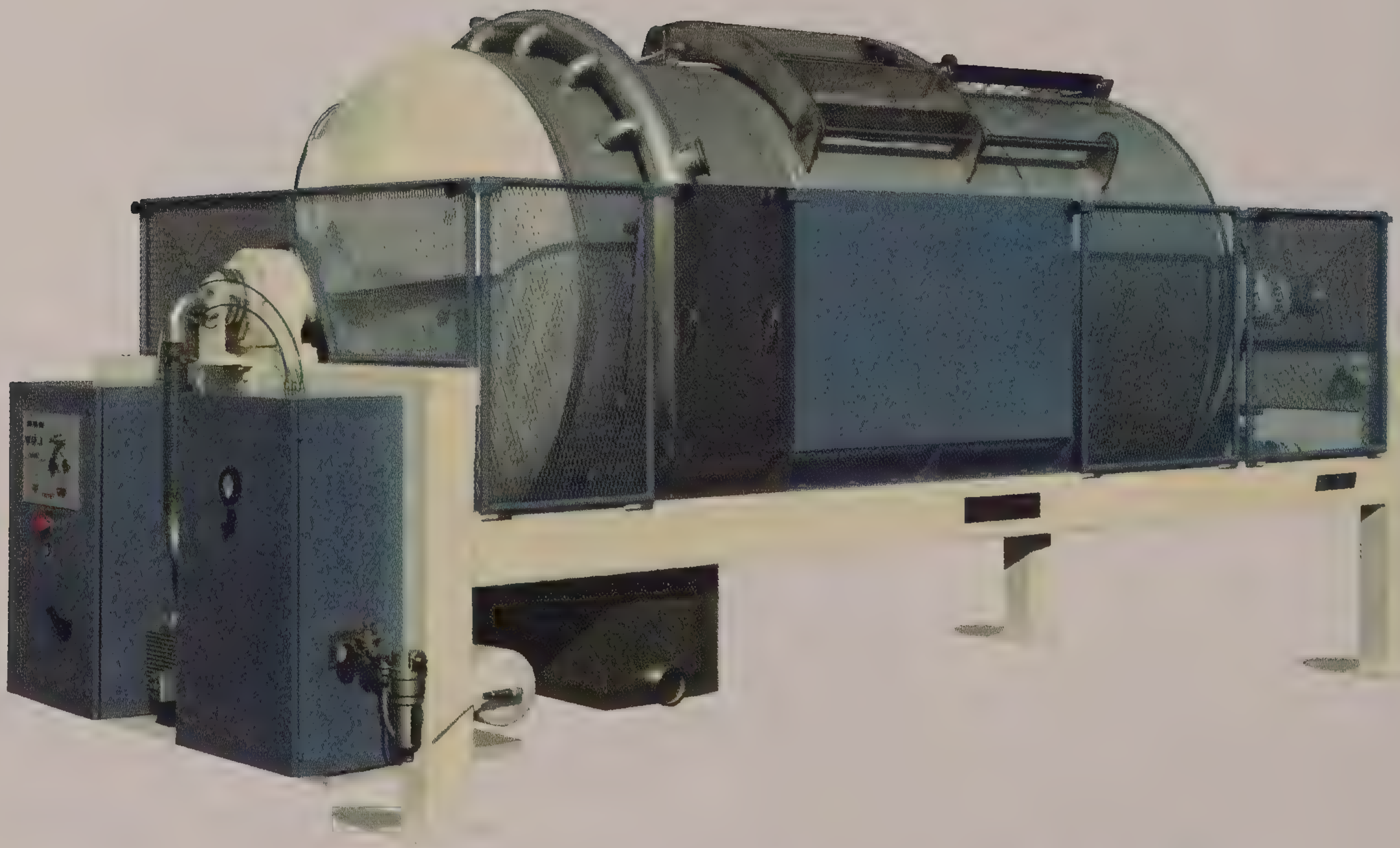

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Minimizing TCA potential

By Bruce Scott, Scott Laboratories

How can a winemaker minimize the chance of having a TCA problem?

2,4,6-trichloranisole (TCA) is somewhat unique. The human animal generally has a poorly developed sense of smell, when it comes to TCA, we have sensory abilities far beyond reasonable expectations. The average person has a TCA-threshold under 10 parts per trillion. It is one of the few chemicals which allows us to empathize with our pets.

TCA is a common odor. My childhood association is with damp newspapers on Boy Scout paper drives. In fact, TCA may develop in any environment where the required elements are present: elemental chlorine, moisture, and mold. Thus, the three elements form a triangle. If any one (chlorine, moisture, or mold) can be removed, the triangle can be broken.

The association of TCA to beverages is not limited to cork. In a winery, TCA can develop in such places as hoses, barrels, pipes, etc. In Europe, Evian water was infected by contaminated plastic screw caps. Crown-capped beer has also been found to contain TCA.

The problem of winery control of TCA is compounded by the fact that wineries are microbiological wonderlands. The atmosphere is controlled, the humidity is constant, and fermentations are oc-curing during much of the year. Caution must be a watchword.

I remember one instance 16 years ago, of a small boutique winery which did a careful filtration of a sweet Muscat before bottling. They wanted to assure sterility. The product was indeed sterile until they stoppered the bottles with corks that had been lying in an open bale within the winery. Within days, they had sparkling Muscat.

This illustration may sound elementary, which is the intention. The point is that every winemaker exercises diligence throughout the winemaking process. This effort should continue through the bottling process. This will provide maximum protection to your product as it goes into the market.

Our experience, plus studies such as those done by Clark Smith, lead to the conclusion that control of cork-borne TCA has two logical aspects:

1. The elimination of corks which are already tainted with TCA.

2. The prevention of TCA formation *in vitro*.

In order to address the first aspect, you must know the enemy. Many people know what TCA smells like. Many other people think they know what it is. It helps to be sure. Misdiagnosis is without value. As an example, if you have a barrel with a 'Brett' infection, you should react differently than if it has a TCA infection. A mix-up may sound improbable, but it has happened.

If you do not have a sample vial of TCA, please contact the Cork Quality Council (CQC, 1200 Jefferson St., Napa, CA 94559). The CQC would be pleased to provide you with a sample. You won't be the first to ask; thousands have been sent by request.

When the sample is received, familiarize your staff with the odor. Thresholds vary significantly from person to person. This is not something that requires an advanced academic degree. Some people have it, some people don't. (To obtain a procedure for qualifying personnel, please feel free to contact the CQC.)

Based upon familiarity, you should develop a basic screening program for pre-existing TCA. CQC members already have done similar testing, but we recommend you also do approvals. Wineries use a variety of tests. They include baby-food jars (available from a bottle supplier), 20 corks in a liter, and other options. We are not recommending one over the other. We suggest, however, that you do some ongoing cork qualification.

Regarding the second aspect (bottle-developed TCA), the idea is to remove the potential for problems. We believe that if you exercise good procedures, bottle-generated TCA can be controlled. If the corks are received, stored, and used properly (soon after delivery), and secondary problems such as seepage and leakers are minimized, the evidence indicates that *in vitro* TCA can be inhibited.

In addition, simply following good practices should reduce bottle variation. This is a noble goal in and of itself. Think of it as the equivalent of your daily two glasses of red wine. You know that you do it for your arteries, but you also get the side benefit of enjoying it.

The current consensus is that TCA formation most likely occurs in the area between the side of the bottle and the cork, rather than between the wine and the cork. This is potentially very important. It means among other things that:

a. You must remember that bottle neck throats are not perfectly cylindrical. After a certain point, they widen. This lower area is a potential pocket for seepage.

b. The longer the cork, the longer the area where you need to have the cork seal against the bottle neck.

Such problems can be resolved with good bottling practices. The CQC has, in fact, developed a list of recommended bottling procedures. CQC members are currently putting them in each box of corks. (Also published in Jan/Feb'93-**PWV**, page 58.)

Helpful review of the basics

1. Corks should be used in machines that are well-maintained. The corker should be regularly serviced and should be cleaned and sanitized on the relevant surfaces before every bottling. Some wineries keep vodka around just for this reason. The higher the alcohol level, the better.

2. The jaws of the corker should be set so that the cork is no smaller than 16-mm at maximum compression. This is even more critical today than before. The dryer the cork, the cell walls are more brittle. Over-compression can result in ruptured walls and reduced resiliency. This, in turn, can lead to higher incidence of seepage.

3. All corks should be stored outside of that nice winery environment which promotes microbiological proliferation. Don't leave them in the cellar or bottling rooms. Do not leave corks overnight in the corker. Corks should be stored under significant levels of SO_2, a minimum of 5-grams/1,000 corks. The

humidity in the storage area should be between 50% and 70% and the temperature should also be between 50°F and 70°F.

4. During bottling, your goal should be to have a final product which has no seepage, and where the bottle pressure is not greater than 3-psi at room temperature. Helpful elements to observe are:

a. The wine to be bottled, should be between 60°F and 70°F.

b. Remember that ullage is critical. The smaller the ullage, the more careful you must be. Vacuums are harder to draw and margin for error is reduced, if you have no space.

c. Just because the gauges on a vacuum pump function, does not mean that a vacuum is actually being drawn. Please remember to check bottles on a regular basis for actual pressures. I recall one July-Monday, a winemaker told me that his leaker problem was due to bad corks. I asked it he had checked his bottle pressures and he said, "No, my gauges worked." In fact, the bottles had excess internal pressure which had gone unchecked during bottling. The corks were exonerated, but not without pain that could have been avoided.

d. Bottle throat variation is real. The cork will compensate in nano seconds, but only to a point. After that, resiliency slows. Long corks in foreign bottles may cause particular problems because of wider tolerance in throat diameter. They may be compounded if you invert immediately. A perfect seal without seepage may become impossible. If you pay $.30 for a 54-mm cork, you obviously want a class product. It is worth the time and effort to protect the wine.

e. Bottle throats should be bone dry, without moisture. If moistened with water, you may be creating an environment where TCA can develop.

Summary

We believe it is important that the bottling process be approached with healthy respect. Winemakers expend significant effort and resources, making the best wine possible. Sustaining these efforts throughout the bottling process only makes good common sense. After all, in many cases, your wine will spend more time in that bottle than it ever spent in a tank or a barrel. ■

(Edited from presentation given in Napa, CA, January 1993, sponsored by the Cork Quality Council.)

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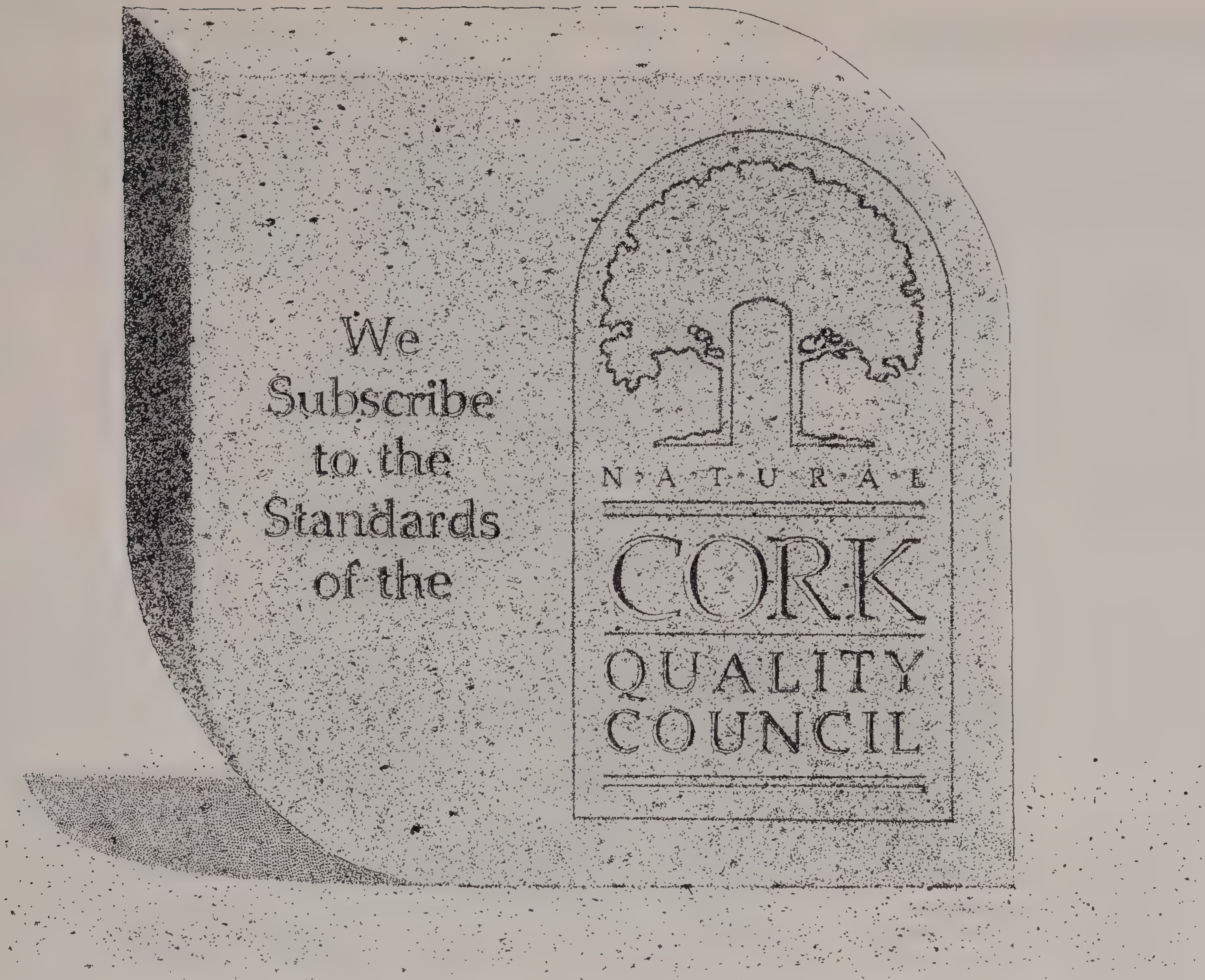
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CANOPY MANAGEMENT DECISIONS / INTERACTIONS:

Effects on fruit quality and vine performance

By Charles E. Edson, Ph.D.,
Southwest Missouri State University
State Fruit Experiment Station,
Gordon S. Howell, Ph.D.,
Michigan State University

Introduction

Canopy structure and the resultant microclimate have a profound effect on fruit quality, disease incidence, vine productivity, and winter hardiness. The basic 'framework' for the canopy is set when the grower selects the trellis design and training system. These factors interact with the inherent growth habit of the grapevine cultivar to create the primary canopy structure.

For example, Riesling (which has a strong upright growth habit) grown on a single curtain, low head system will present an entirely different primary canopy structure than Vignoles (which has a semi-upright growth habit) grown on Geneva Double Curtain (GDC).

This basic canopy structure is further modified by environmental and cultural influences on vine vigor. If we think of seasonal grapevine growth as a cycle, we can treat environmental factors and cultural management tools as inputs that modify that cycle and influence the output or vine productivity (Fig. 1). It is important to consider that none of these factors operate in isolation. Rather, they work in concert to modify vine vigor and hence the canopy microclimate.

Canopy microclimate plays a central role, in that it is strongly influenced by several environmental and cultural inputs, which integrate to influence vine performance and fruit quality (Fig.1).

Vine vigor management

We would like to emphasize that in many ways, proper canopy management can be thought of as 'proper vine vigor management.' Problem canopies result when vine vigor is excessive, causing shaded conditions in the fruiting and renewal zones.

Several management practices have been referred to as 'enlightened'; they are cultural activities that can be used to balance vine vigor and crop load to create a proper canopy microclimate that affords adequate sunlight penetration into the fruiting zone (A. Reynolds, ASEV Annual Meeting, Seattle, WA 1991). Among those are site and soil factors, choice of cultivar/rootstock, proper trellis design, vine density, pruning practices, crop control, fertilization, irrigation, and vineyard floor management (Table I).

By using 'enlightened canopy management', a problem canopy is not allowed to develop. Other practices have been termed 'remedial,' 'reactive,' or 'bandaid approaches' that are used to correct problem canopies that can be caused by

Fig. 2 Influence of training system on the location of the primary fruiting zone (hatched area). Clockwise from upper left: low head: high head; high cordon; low cordon. Adapted from reference 5.

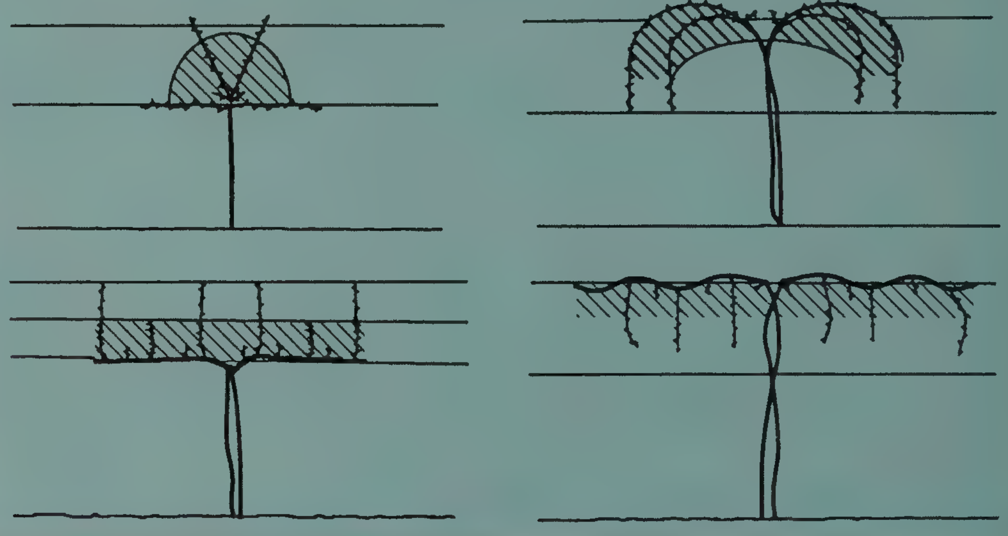


Fig. 1 Environmental and cultural factors that influence the seasonal development of the grapevine canopy microclimate.

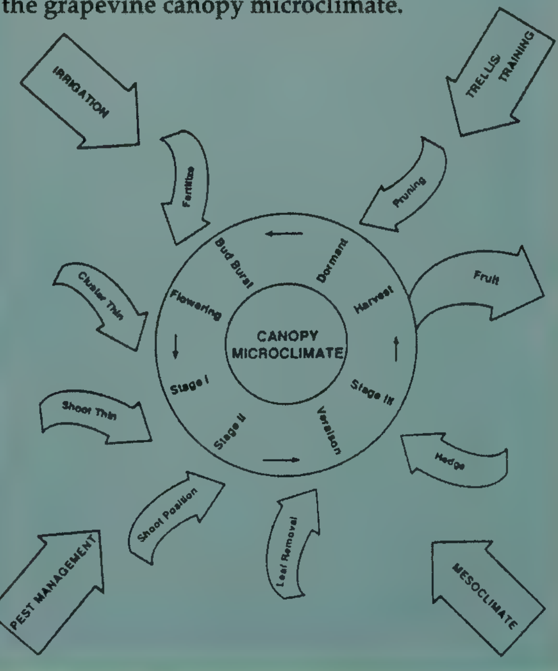
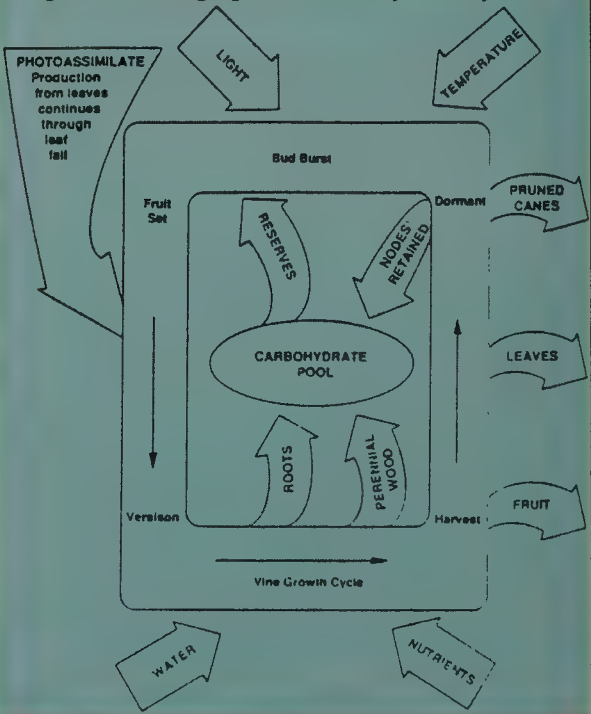


Fig. 3 Seasonal grapevine carbohydrate cycle.



excess vine vigor or other problems such as excessive shoot density.[18] Hedging, leaf removal, and shoot thinning could be considered as remedial canopy solutions (Fig.1), although hedging and shoot thinning can be used as techniques to help modify vine vigor, as well.

Sunlight

Several physiological processes are dependent upon light (Table II). Photosynthesis may be the most important of these, since the carbohydrates necessary for vine growth and fruit development are produced by this process.

Table I

Canopy microclimate: factors that integrate to influence vine vigor and productivity.

1. Mesoclimate (site characteristics)
2. Soil factors (type and fertility)
3. Cultivar/Rootstock
4. Vineyard spacing, training, pruning
5. Fertility program
6. Pest control program (to maintain functional leaf area)
7. Vineyard floor management
8. Irrigation
9. Canopy manipulation

Table II

Physiological processes with seasonal light requirements.

1. Photosynthesis
2. Vegetative growth
3. Flower cluster initiation and development
4. Veraison (color development)
5. Fruit growth and ripening
6. Cold hardiness (wood maturity)

Table III

Canopy microclimate effects on some viticultural factors.

(increase +; decrease -)

Factor	Exposed	Shaded
Fruitfulness	+	-
Yield	+ quality	- quality
Wood maturity	+	-
Air movement	+	-
Spray penetration	+	-
Disease incidence	-	+

Compiled from references 3, 4, 6, 13, 16, 17, 18

Grapevine canopies strongly attenuate sunlight.[13,18] One leaf layer can reduce the amount of ambient light by as much as 93%.[18] A canopy, several leaf layers thick, can cause shaded conditions that can have a negative impact on growth (Table III), and fruit composition (Table IV).

An open canopy allows adequate light penetration into the fruiting and renewal zone, enhancing bud fruitfulness, vine yield, and wood maturity (Table III). Additionally, air movement and spray penetration into the canopy are improved, tending to reduce disease incidence (Table III). Exposure to light positively influences several components of fruit composition,[6,11,12,15] improving ripeness parameters, and the synthesis of both pigments and flavor compounds (Table IV).

Trellising and training system

Trellis design and training system combine to create the primary canopy structure. The primary canopy structure, in large part, dictates where the fruiting zone is located in relationship to the vegetative portion of the canopy (Fig.2).

High wire systems place the fruit in the upper part of the canopy above most of the vegetative growth. Low wire systems tend to place the fruit below the vegetative growth (Fig.2). Differences between cordon and head-trained vines can also be observed (Fig.2).

The inherent growth habit and vigor of the cultivar, as well as the site/soil/environment interaction with the cultivar should be considered when choosing a training system.

Table IV

Canopy microclimate effects on fruit composition.

(increase +; decrease -)

Factor	Exposed	Shaded
Ripening	+	-
Soluble Solids	+	-
pH[a]	-	+
Potassium	-	+
Titratable acidity	-	+
Malic acid	-	+
Tartaric acid	+	-
Anthocyanins	+	-
Monoterpenes	+	-
Phenolics	+	-

[a] pH effects at equivalent SS

Compiled from references 12, 13, 14, 15, 18.

For example, high wire systems such as GDC or high cordon are appropriate for procumbent (trailing growth habit) cultivars, while a lyre or low cordon system are better suited to cultivars with an upright growth habit. Similarly, highly vigorous vines are best suited to divided canopy trellising (e.g. GDC or lyre), since these systems extend the canopy length per vine, reduce shoot density (if properly managed), and increase light penetration into the fruiting and renewal zone.[11,17,18]

Simply using a wider vine spacing within the row might help control vigor and improve canopy microclimate, but would likely not result in the improved yields and fruit composition associated with divided canopy systems.[11,18]

Training systems alone can have an impact on light penetration into the canopy. Leaf layer number (LLN) is a measure of canopy density determined by point quadrat analysis.[18]

To conduct point quadrat measurements, a long thin rod (similar to a welding rod) is randomly inserted into the canopy through the fruiting zone (50 to 100 insertions per canopy type being measured). The rod is considered to mimic a ray of light entering the canopy. Whatever the tip of the rod encounters on each insertion is recorded (e.g. leaf, cluster, shoot, or gap in the canopy). LLN is calculated from this data. The reader interested in the details of this technique is referred to reference #19.

LLN is high if many leaves are encountered by the rod, indicating a dense, shaded canopy. Conversely, LLN is low if the canopy is open, providing plenty of sunlight into the fruit zone. LLN greater than 1.0 to 1.5 is considered excessive for cultivars of *Vitis vinifera*.[18] Critical LLN values for hybrids may be somewhat different, but have not yet been confirmed experimentally.

In a recent study, Chardonel grapevines trained to a bilateral high cordon training system had LLN less than 1.5, while Chardonel vines trained to a high head training system had LLN greater than 2.[4]

This response is typical for head-trained vines which tend to concentrate the fruit in a zone fairly close to the head of the vine. Excessive shoot density can cause shading in this zone. This is especially true in large, vigorous vines, which require greater node retention at pruning. This problem is not so great in smaller vines, which require the retention of relatively fewer nodes at pruning.

Conversely, cordon training tends to spread out the nodes retained, reduce shoot density, and help create the more favorable light climate observed in the Chardonel study.[4]

Carbohydrates

One way to help maintain a proper canopy is to balance vine vigor and yield. Each season the vine has a certain capacity for total reproductive and vegetative growth. Vine capacity can be considered as a central feature of a cyclic carbohydrate pool, which supplies the vine's needs for growth. This pool is replenished seasonally as the vine produces carbohydrates through the process of photosynthesis (Fig.3).

Each season at bud burst, the vine draws upon carbohydrates in the storage reserves (perennial wood and roots) as growth begins. Early, vegetative growth (leaves, shoots) is produced at the expense of storage reserves. Later, when the leaves are old enough (30% to 50% fully expanded),[7] they produce carbohydrates via photosynthesis, which are exported, adding to the carbohydrate pool.

Table V

Influence of nodes retained on the yield of Concord grapevines. Sodus, Michigan

Nodes retained	Yield (kg/vine) 1985	1986	1987	1988	1989	Mean
30+10	8.49b	5.28	11.98b	14.07b	17.25	11.41b
90/vine	14.07a	4.31	16.55a	17.06ab	22.19	15.29a
120/vine	18.24a	6.90	18.20a	19.34a	22.01	16.35a
	**	n.s.	**	*	n.s.	*

n.s./*/** not significant or significant at 5% or 1% level respectively. Number followed by the same letter within columns are not significantly different.
Data from reference #10.

Other factors such as light, water, nutrition, and genotype clearly influence this process. At the end of the season, a portion of the carbohydrates are removed as fruit (economically, the component that interests us most), leaves that abscise, and wood that is removed during pruning. Perennial wood (trunks, cordons), roots, and the wood retained at pruning function as storage sites for carbohydrates.

Crop load effects

Crop control (through pruning and cluster or shoot thinning) has a tremendous influence on vine vigor. Crop load directly influences vine growth in several ways. The most obvious influence is on yield.

In Michigan, David Miller and G.S. Howell have investigated overcropping using Concord grapevines.[10] Vines were

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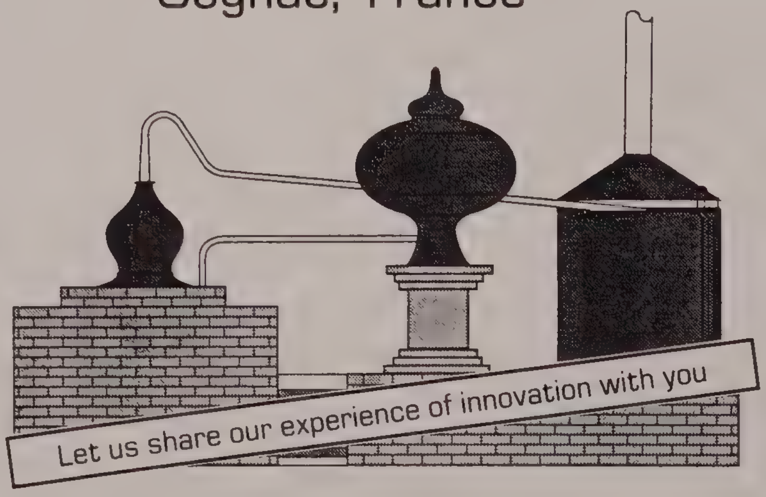
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Table VI

Influence of nodes retained and subsequent crop load on soluble solids of Concord grapevines. Sodus, Michigan.

Nodes retained	(Soluble Solids %) 1985	1986	1987	1988	1989	Mean
30+10	15.9a	15.7	13.8a	13.8a	13.9a	14.6a
90/vine	14.9b	15.0	12.8b	13.1b	12.9b	13.8b
120/vine	14.0c	15.2	13.3b	12.7b	12.0c	13.4b
	**	n.s.	*	*	*	**

n.s./*/** not significant or significant at 5% or 1% level respectively. Number followed by the same letter within columns are not significantly different. Data from reference #10.

pruned either to a standard 30+10 severity with a 65-node maximum, 90 nodes/vine, or 120 nodes retained per vine.[10] Average yield per vine was positively correlated with nodes per vine (Table V). Over time, this would amount to several tons/acre in increased yield and hence, significant revenue.

However, there was a price to be paid. Fruit sugar content (as percent soluble solids) was lower for the heavily cropped vines (Table VI). More importantly, vine size was reduced by heavy cropping. After five years of the study, vines cropped at 120 nodes were only ½ the size of vines balance-pruned to 30+10 (Table VII). Additionally, we can recount from observation, that several vines cropped at 120 nodes had begun to weaken and die.

There is an interesting trend in the vine size data. In 1986, there was a late frost that effectively reduced the crop load and subsequent yield in all treatments (Table V). This allowed vine size to recover for 1987, even in the heavily-cropped vines (Table VII).

Some growers who see this data suggest the possibility of maintaining very high crop loads for a few years, followed by a reduced crop to allow the vine to recover. Caution is urged. Vine size can drop quickly in heavily-cropped vines (Table VII).

All factors in a management system must be considered before choosing the amount of crop to retain for a given set of vines. Additional fruit composition requirements for wine grapes and cold hardiness deserve consideration before allowing the vines to bear excessive crops.

Crop load has several influences on vine morphology. High crop load reduces shoot growth and total leaf area per vine.[1] This influence is established early, by midseason, and remains through harvest (Fig. 4). Leaf size is also affected. Leaves are smaller on vines carrying a heavy crop.[1]

Importantly, morphology (hence vine vigor) is influenced in other ways; lack of water will further reduce shoot vigor, root number, and root penetration in heavily cropped vines.[9]

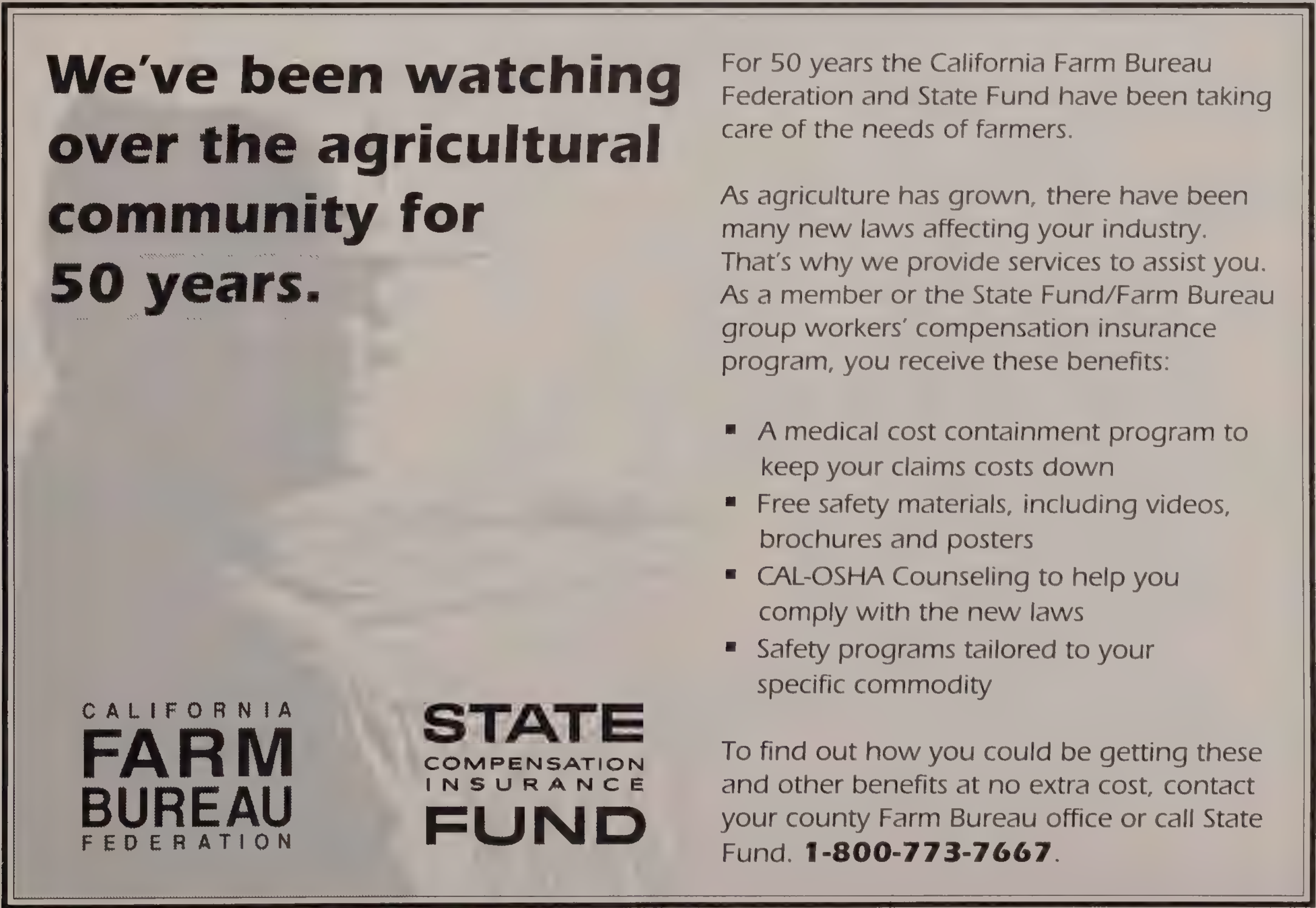

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Fig. 4 - Influence of crop load on leaf area accumulation at several phenophases in Seyval grapevines. Adapted from reference 1.

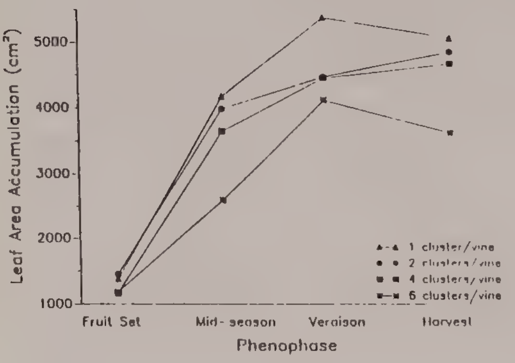

Table VII

Influence of nodes retained and subsequent crop load on vine size of Concord grapevines. Sodus, Michigan.

Nodes retained	Vine Size (kg/vine) 1985	1986	1987	1988	1989	Mean
30+10	1.28	2.24a	3.18a	3.03a	1.46a	2.24a
90/vine	1.05	1.33b	2.13b	2.13ab	0.93ab	1.60b
120/vine	1.20	1.16b	1.98b	1.58b	0.62b	1.31b
	n.s.	**	**	*	**	*

n.s./*/** not significant or significant at 5% or 1% level respectively. Number followed by the same letter within columns are not significantly different.
Data from reference #10.

The vine also compensates physiologically for these adjustments in vine vigor. One measure of this physiological adjustment is photosynthesis. When we measured vine photosynthesis in potted Seyval vines at a mid-shoot leaf, we found that photosynthesis was positively correlated with crop load.[1] Those vines with a heavier crop grew fewer, smaller leaves which had to work harder (photosynthetically) to produce enough carbohydrates to support growth.

Partitioning photoassimilates

The pool of carbohydrates produced during photosynthesis (called photoassimilates) is allocated to the various vine organs according to a priority system within the vine. The different organs are called 'sinks' by plant physiologists.

Fruit is the most powerful sink (or competitor for carbohydrates), having first priority for photoassimilates. This helps explain the strong influence crop load has on vine vigor. Vegetative structures (e.g. leaves, shoots) are stronger sinks than roots, which are stronger sinks than storage tissues.

Cold hardiness can also be considered a sink, although a very weak sink.[2] Therefore, the needs of the fruit are taken care of first, while the carbohydrate needs associated with winter hardiness are filled last.[1,2]

It is extremely important to maintain healthy foliage throughout the season to encourage high rates of photosynthe-

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Table VIII

Influence of crop load on dry matter partitioning of Seyval grapevines at harvest.

Crop Load	Total Dry Wt. (g)	% Current[a]	% Storage
6 cluster/vine	276.8	64.4	35.6
4 cluster/vine	307.3	65.6	34.4
2 cluster/vine	298.5	59.3	40.7
1 cluster/vine	288.9	54.3	45.7
0 cluster/vine	285.8	49.0	51.0
	n.s.	**	**

[a] Current = Percent of total allocated to leaf + shoot + fruit dry wt. ; Storage = Percent of total allocated to root + perennial wood dry wt.
Data from reference #1.

Table IX

Factors that influence vine hardiness

1. Inherent hardiness of the cultivar
2. Carbohydrate status of the vine
3. Tissue moisture status
4. Light exposure
5. Crop load
6. Midwinter minimum temperatures
7. Preconditioning (temperature regime prior to the freezing event)

Compiled from references 2, 3, 16.

sis and hence, adequate carbohydrate accumulation. By the same token, dense shaded canopies are inefficient due to reduced rates of photosynthesis associated with low light levels.

The strong influence that crop load has on the allocation of carbohydrates becomes evident if the vines are partitioned and the dry weight accumulated in each of the vine parts during the season is measured.

In our study of potted Seyval vines, no changes in dry weight distribution patterns were observed until veraison.[1] At harvest, vines that were defruited had allocated 15.4% more of their total carbohydrate to storage reserves than those vines that were heavily cropped (Table VIII). The root system was considerably larger on the defruited vines than the heavily cropped vines, in spite of the total dry weight of these vines being the same at harvest.

Essentially, the heavily-cropped vines put their energy into producing fruit, rather than roots. This means defruited or lightly cropped vines go into the dormant season with greater storage reserves. This should enhance winter survival.[2]

Just as many factors interact to influence canopy vigor, so too do several factors integrate to influence cold hardiness (Table IX). Well-exposed canes have more mature nodes and are hardier than those that are poorly exposed.[3,16] This response is similar for all cultivars, but

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seems to be even more important for cultivars that are inherently less winter-hardy.[3] This underscores the importance of proper vigor and crop control and the maintenance of a good canopy microclimate.

Remedial canopy management practices

There are a few management techniques which can be used to correct problem canopies. Problem canopies are dense, shaded canopies caused by excessive vine vigor.

• Shoot positioning

Shoot positioning (or shoot combing) is a cultural practice in which the shoots are positioned vertically (by combing downward for procumbent cultivars, or training shoots upward for upright growing cultivars) with the goal of improving light penetration into the canopy.

Shoot positioning is also considered a devigorating practice, often resulting in decreased vine size.[11,18] In unpositioned canopies, some shoots tend to grow horizontally along the trellis wire, creating a shaded condition.

Light penetration into the fruiting zone is improved following shoot positioning. Dr. Justin Morris, *et al.* reported an increase in yield of over two metric tons/hectare for shoot-positioned Niagara grapevines compared to non-positioned vines.[11]

The above study also demonstrated the interaction that occurs between training systems and a cultural practice such as shoot positioning. Yields of vines trained to GDC were higher than those on a bilateral high cordon system, whether or not the vines were shoot-positioned. However, fruit quality for the non-positioned, high cordon vines was well below that of the GDC vines (positioned or not) and the shoot-positioned high cordon vines.[11]

• Hedging

Hedging is another technique commonly used with upright-growing cultivars to help increase light penetration into the canopy (although it can also be used with procumbent cultivars). Do not hedge too severely. Research shows that at least 15 to 20 leaves per shoot (this can include lateral leaves) should be retained to ensure adequate leaf area to fruit ratio to ensure fruit and wood maturity.[8] Severe hedging delays ripening, decreases hardiness, and decreases fruitfulness.[6,15]

• Leaf removal

Leaf removal is another remedial canopy management tool that can be used to increase light penetration and air movement in a dense canopy. Leaves are removed in the fruiting zone to better expose the fruit (and wood).

There are several benefits to be gained from leaf removal, such as an increase in anthocyanin synthesis (color), and monoterpene accumulation (compounds responsible for floral, fruity characters), accompanied by a decrease in those flavor components which cause herbaceous characters in wines.[6,14,20]

Leaf removal can help increase air movement and spray penetration into the fruiting zone and decrease the incidence of Botrytis.[8,18] As with hedging, leaf removal can be overdone, with similar consequences.

Summary

We have reviewed several concepts involved with proper canopy manage-

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ment. Factors that influence development of the canopy structure and the resultant canopy microclimate were discussed. The importance of balancing vine vigor and crop load to achieve an open canopy was emphasized.

Grapevines act as a balanced system; fruit is produced at the expense of vegetative growth and carbohydrate accumulation in storage reserves. Cultural management practices a grower may employ do not act in isolation. Rather, proper canopy microclimate is the result of many interacting factors.■

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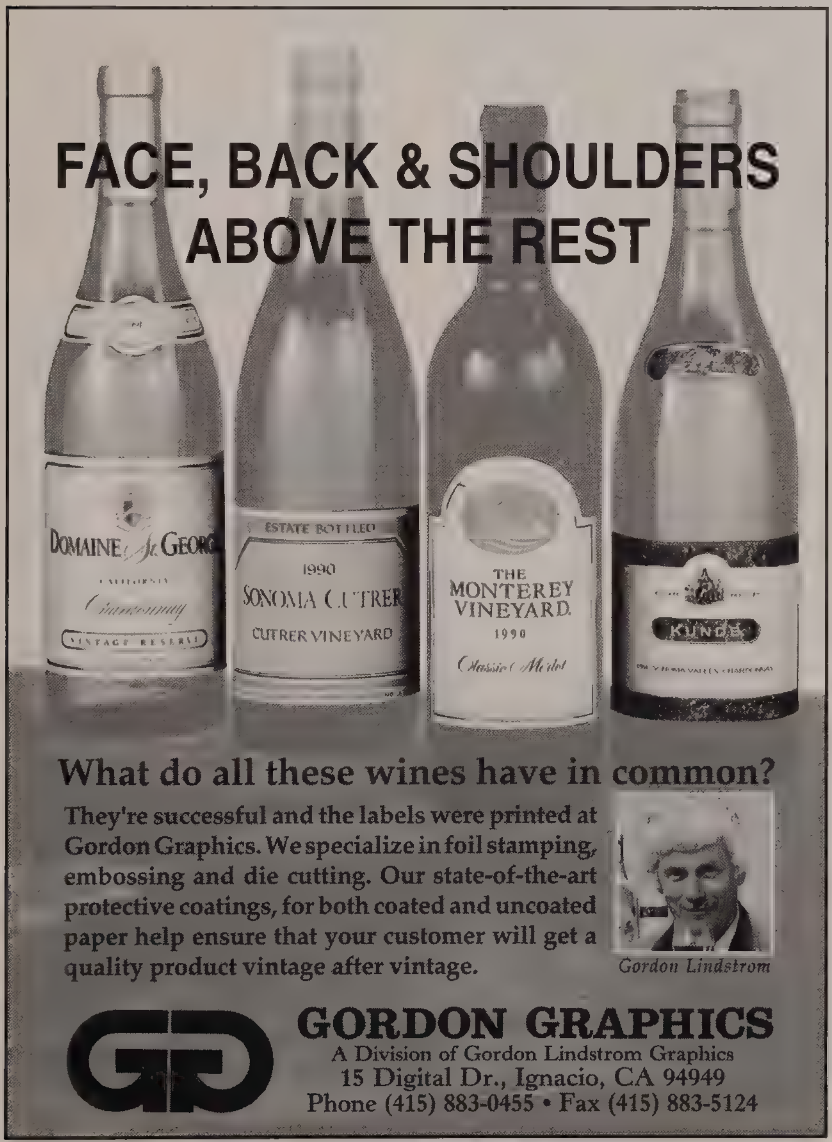
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See our ad on page 60.

AF Equipment	224

AgFast Corp. 307

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Alasco Rubber & Plastics	233
Alpine Scientific	723
Am. Grape Harvesters	704+706

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Broad insurance coverage and proceeds help support the wine industry program on Capitol Hill.

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Antonio Carraro Tractor	237

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BDM Construction	732

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Barrel Builders, with more than 20 years of service to the industry invites you to stop by our booth to say hi and see our full line of cooperage and supplies, from our Marchive French oak barrels to our bungs, oak chips, Bitard barrel washers, maintenance and specialty products.

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Berlin Packaging	420+422
Bio-Rad Laboratories	306

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Some people just sell labels... we sell solutions. See the experts at Blake Printery for fine wine label printing.

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See our ad on page 75.

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See our ad on page 40.

The Boswell Company 103

French oak barrels, upright tanks, and ovals from Tonnellerie RADOUX in Cognac and 228 liter Burgundy barrels from Tonnellerie SIRUGUE in Nuits-Saint-Georges. Wine cellar tools: Bulldog's Pup racking device, stainless steel barrel stirring rods, Boswell silicone rubber bungs, Dujardin glass wine thieves, and hose cleaning balls.

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See our ad on pages 54+79.

California Glass Co.	521
Cal. State Univ. Fresno	326
Calpac Container	600+602

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Cellulo Company represents Pacific Press Co., and their complete line of Pac Press filters made in the U.S. The Pac Press lees filter has unique features that make it one of the most advanced lees filters available; including recessed gasketed plates with a positive seal (rated **not** to leak up to 100 psi) and the exclusive "Duo-Step" which allows for the expansion of the press without factory modification.

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See our ad on page 58.

Condimenta GmbH 234
BITEC vino starter cultures for the induction of malolactic fermentation in wine. The vino culture consists of 3 or 4 pure strains of *Leuconostoc Oenos*, isolated for their ability to perform fast and complete MLF at low temperatures, and in wines with low pH and high alcohol content. At least 3 x 10^{11} viable bacteria/g starter culture is guaranteed.
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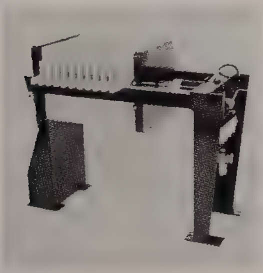
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Demptos Glass Co. 227+229

Demptos Napa Cooperage 335
Premium French Oak wine barrels constructed in the traditional Chateau, Chateau Ferres and Burgundy Export styles. Available in 28L, 56L, 112L, 350L, and 500L sizes from the French oak forests of Nevers, Allier, Troncais, Limousin and Vosges. Custom toasting and special oak selections, including thin staves, available. Head toasting upon request.
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See our ad on page 59.

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Custom grafted grapevines and rootstock. Come by and see our Big Pot Benchgrafts.
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Emmolo Nursery 729

ENCORE Inc. 235
Wine bottling and shipping supplies and services. A full selection of new and resterilized bottles will be featured along with our exclusive molded fiber shippers, corks and capsules. For both Bottling and recycling information, experienced advisors will be present to assist you.
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Enerfab	301
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Estate Bottling 330
Portable wine bottling at your winery, two label capacity–1,500 cases/day.
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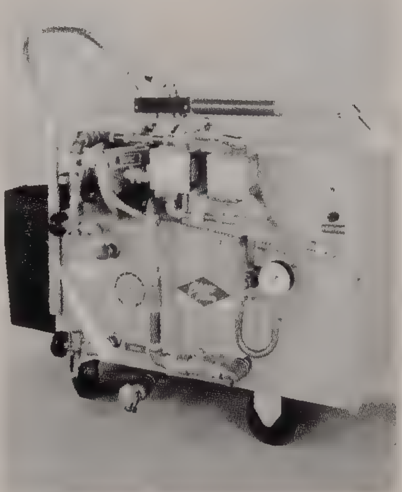
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Fisher Scientific	608
Fordras SA	712

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The QNV near infrared analyzer, designed specifically for the analysis of liquids, is compact and self-contained. Two modes are available: QN100V with memory storage of 100 results and QN 2000V with memory storage of 200 results and extended calibration editing facilities. The QNV is ideal for the analysis of alcohol and sugars in wine and spirits.
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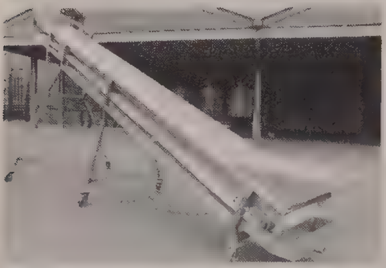

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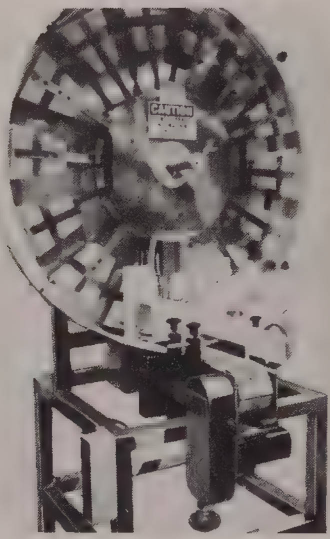

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Liquid Air Corp.	406
Lithomania	131
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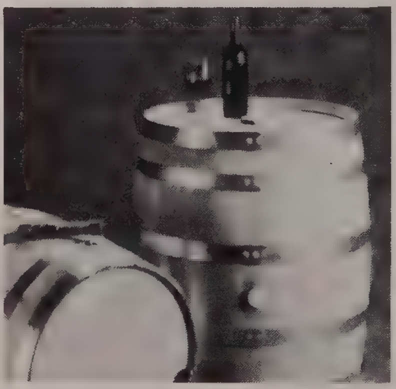

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Morisson Couderc	606
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Packaging Corp. of America	630
Packtech	429

Pickering Winery Supply 334-336

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See our ad on page 63.

Practical Winery & Vineyard	720
Pradel Barrel	605
Praxair Inc.	328
Primus Laboratories	226
Provost & Pritchard	228

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R. Prulho S.A. 627
Designer and builder, for more than two generations, of the world reknown copper alambic pot still including a full range of support equipment. Alambic pot still size ranging from 20 to 10,000 liters.
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Quiedan Co. 531+533

RLS Equipment Co., Inc. 411
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Top quality tin foils for still wines and polylaminate foils for champagne. Total service for stock capsules in ten colors and two sizes...all available to be shipped the same day.
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Red Star Yeast 216
Remy Packaging 707

Rock-Tenn Co. 522+524
Rock-Tenn is a leading manufacturer of solid fiber partitions. New, innovative WineGUARD™ partitions provide superior wine label protection. Lab tests show an over 400% reduction in label abrasion with WineGUARD™ as compared to corrugated partitions. In addition, solid-fiber reduces case size, dust, and since it is 100% recycled, is environmentally friendly.
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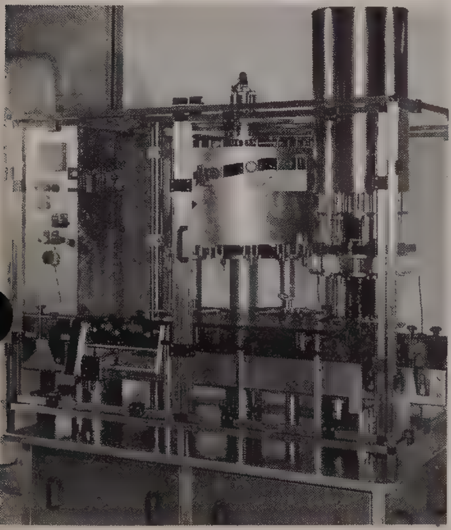
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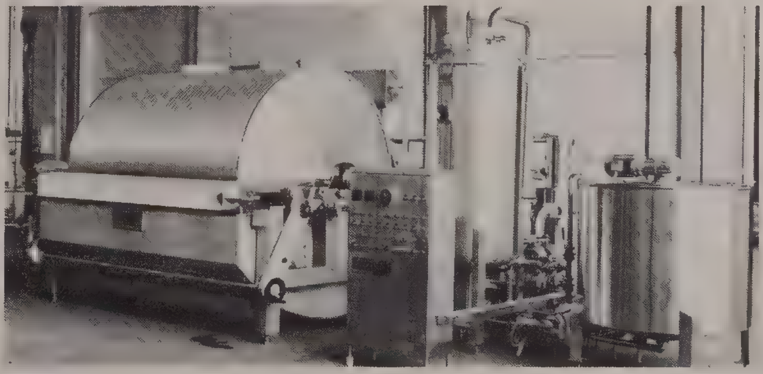
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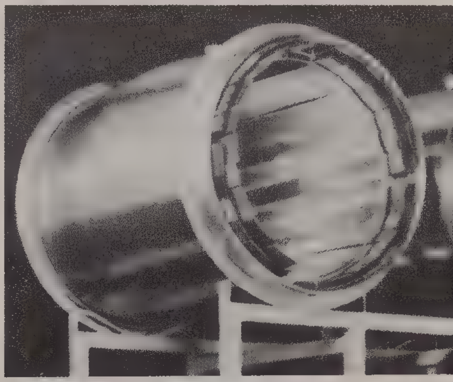
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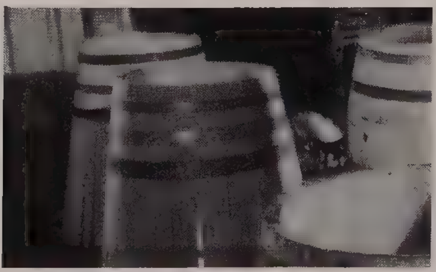
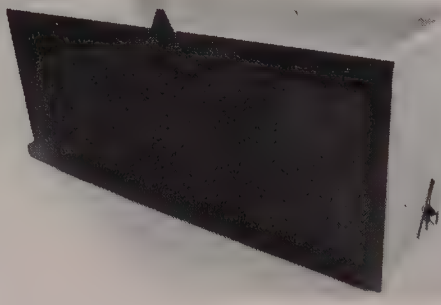
JUNE 22-25,
Tuesday through Friday

Pre-Annual Meeting Seminars (Tuesday): "Cover Crops: A Practical Tool for Vineyard Management"; "Environmental Issues: Compliance Overview"; and "Regulating the Laboratory: The Chemical Hygiene Plan." Technical Sessions and Supplier Exhibits: Wednesday/Friday. Honorary Research Lecture: "Integrated Evolution of Trellis-Training Systems and Machines to Improve Grape and Vintage Quality of Mechanized Italian Vineyards," by Cesare Intrieri (University of Bologna, Italy), 2:30pm Wednesday. Merit Award Lecture: "A Quiet Revolution in Viticulture," by Amand N. Kasimatis, 11am Thursday. Forum: "Grapevine Virus and Certification Issues," 1pm Friday. **Location:** Sacramento Community Convention Center, Sacramento, CA. **For more information, contact:** ASEV tel: 916/753-3142.



Tonnellerie Francaise



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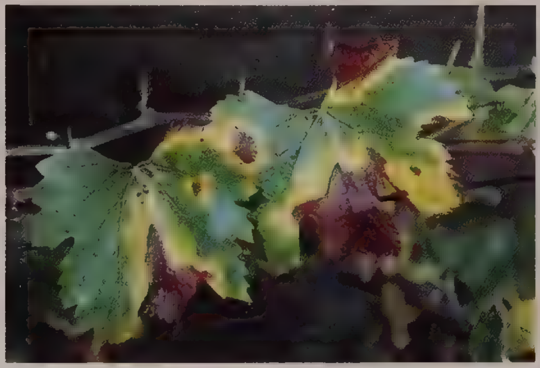
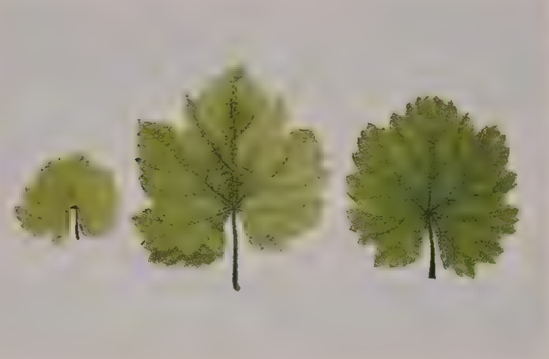
Part II

EPIDEMIOLOGY AND CONTROL: Pierce's disease

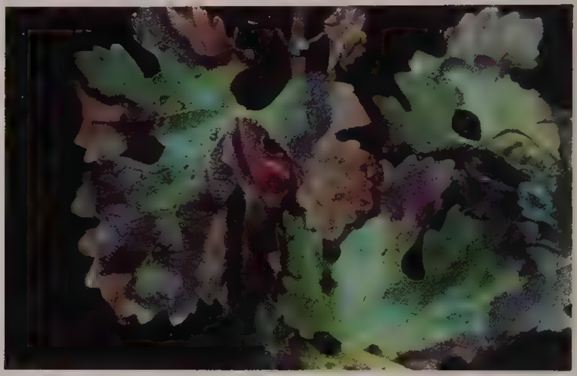


Pierce's disease in Chardonnay



Spring symptoms in Chardonnay, healthy (right), Pierce's disease (left)

Photos by Jack Kelly Clark



Pierce's disease in Merlot

By Alexander Purcell,
Dept. of Entomological Sciences
University of California, Berkeley

Pierce's disease (PD) is a lethal disease of grapevines caused by a bacterium (*Xylella fastidiosa*) that multiplies in the plant's water-conducting tissues (xylem). The bacteria are transmitted to grapevines by certain xylem-feeding leafhoppers called sharpshooters. Part I (**PWV**-March/April'93) reviewed the occurrence and impact of PD, how the disease spreads in California vineyards, and the history of PD research.

Many steps in the PD disease-cycle are deceptively simple. The causal bacteria are spread from plant to plant by the sharpshooter leafhoppers as they feed on xylem sap. The bacteria then multiply and spread throughout the xylem system of infected plants.

In grapevines, masses of bacteria block water transport and cause leaves and fruit to wither during periods of water stress. The bacteria can be picked up by sharpshooters from many different species of plants, but infection does not cause diseases in most kinds of plants.

Several key questions are not explained by this simple view of how PD develops and spreads. Why doesn't PD appear to move from grape to grape — at least in California (see Part I)? Why doesn't insecticidal control of sharpshooter vectors within vineyards reduce the spread of the disease?

What is the relationship between the numbers of PD-vectors and disease spread? What limits the geographic distribution of PD and its severity? Why do the bacteria spread faster and farther within some grape varieties? The answers to these questions explain why some typical disease control tactics don't work for PD, why other methods of prevention must be used, and why even these are not always satisfactory.

Symptoms

The first practical concern is how to recognize PD. The marginal discoloration and drying that gives a 'scorched' appearance to leaves late in the growing season is the most characteristic symptom of PD. This marginal leaf burn and raisining of fruit is caused by restricted water movement through parts of leaves or bunches blocked by masses of *X. fastidiosa*. The extent and concentrations of bacteria in grapevines are greatest several months after vectors introduce the bacterium into the plant.

The first symptoms of chronic water stress appear on the foliage by mid- to late summer. Depending on temperatures, the transpiration demands of portions of the leaf will eventually exceed the water supply from blocked xylem vessels. The cells in these stressed portions of the leaf will collapse. If the plant's demand for water is later reduced below supply, the collapsed cells may recover, but become yellow. If part of the leaf dries while green, it later turns brown.

High temperatures, low humidity, wind, and low soil water availability increase water stress and accelerate the appearance of symptoms. But vines infected by *X. fastidiosa* eventually will have PD-symptoms, even with abundant soil water.

The slowly increasing marginal 'scalding' or 'burning' progresses until most of the leaf blade is affected. Petioles also dry from the blade end down towards the base. Often, the leaf blades will fall, while the petioles remain attached to the canes. Another unique PD-symptom is the irregular wood maturation of the canes, producing patches of green, immature bark surrounded by mature brown bark.

Leaf symptoms vary among grape varieties. Pinot noir and Cabernet Sauvignon have highly regular zones of progressive marginal discoloration and drying, but in Thompson Seedless and Chenin blanc, the discoloration and scorching may occur in sectors of the leaf rather than along the margins.

Spring symptoms

Spring growth of grapevines, infected the previous year, is delayed and stunted because of lower food reserves stored in diseased plants the previous season. New leaves may be chlorotic (yellowed), especially between leaf veins. Leaves usually are stunted and distorted, with shortened, 'zig-zag' internodes on canes. These are similar symptoms to zinc deficiency.[1,2] In fact, nutrient analyses of leaf petioles from vines with PD often show a deficiency of zinc, but plants with PD do not respond to zinc fertilization.

After infected vines begin to produce sufficient carbohydrates from new leaves, growth may resume at a nearly normal rate until late summer.

Climatic differences between regions can affect the timing and the severity, but not the type of PD-symptoms. In the southern Central Valley of California, symptoms may appear in late July, but not until September in the coastal valleys.

Other disorders that cause water stress can produce some symptoms similar to PD. For example, oak root fungus and grape phylloxera cause foliar 'scorching', but can be distinguished from PD by examining roots for distinctive signs of these two disorders. Vines with oak root fungus will have white, threadlike fungal growth with a 'mushroom' odor beneath the bark of the roots. The bark of phylloxera-damaged vines easily sloughs off affected roots, and the insects can often be observed.

Foliar 'scorching' caused by excessive salts in soils usually does not produce a band of discolored or chlorotic tissue preceding the zone of dried, brown outer leaf tissue as caused by PD.

Commercial laboratories can confirm if plants harbor *X. fastidiosa* using serological tests such as ELISA (Enzyme-Linked Immunosorbent Assay). You should arrange in advance for laboratories to receive your shipment of plant samples. Ask the lab to advise you on how to take the samples and mail them.

Symptomatic leaves sampled from August through October which are still attached to green portions of canes generally give the most reliable test results. You should tag the samples and the plant from which they were taken so that these can be referenced after you have test results.

Bacterial multiplication and spread within plants and insects

X. fastidiosa initially multiplies rapidly in a grapevine weeks before symptoms appear. The bacteria also spread throughout the xylem. How the bacteria move from cell-to-cell is not known. Almond and alfalfa are two crop plants in which *X. fastidiosa* causes disease, but many other plants harbor the bacterium without having any symptoms of disease.

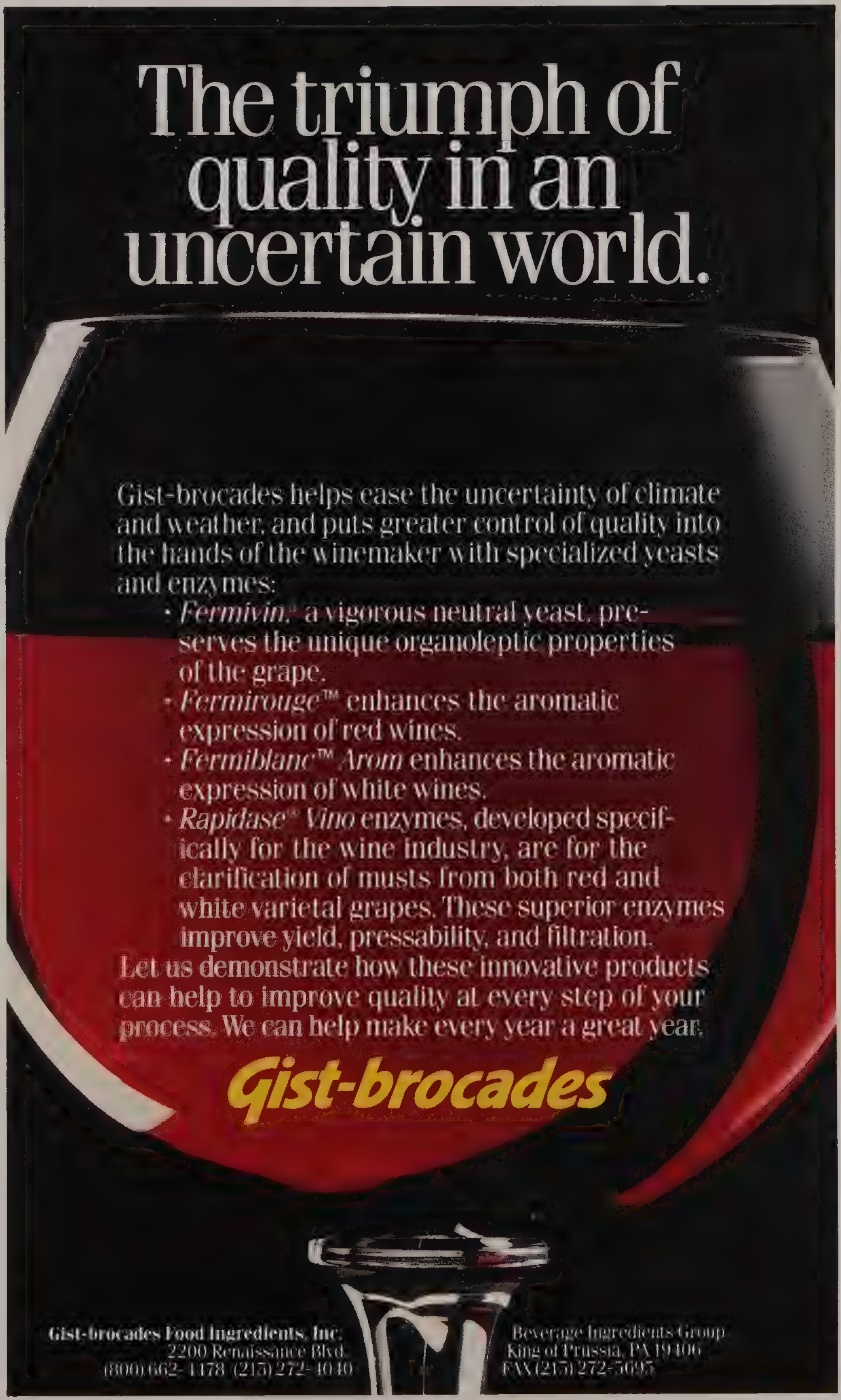
In tests conducted during the 1940s, non-infectious sharpshooters acquired the causal bacteria by feeding on plants that had previously been fed upon by infective sharpshooters. Of the 100 plant species tested in this way, 75% proved to be 'hosts' of the PD-bacterium, which was then thought to be virus. Only a few species ever developed disease symptoms in these tests.[3]

Vector acquisition and ELISA tests have documented that natural vegetation near vineyards, and even wild plants distant from agriculture, harbor the causal bacteria.[3,4] It has not been confirmed if all symptomless hosts support the multiplication and systemic movement of *X. fastidiosa*. Our laboratory is now investigating how *X. fastidiosa* spreads and persists within symptomless hosts.

Vectors

Currently, only leafhoppers specialized for feeding on xylem and insects in the spittlebug family are confirmed vectors. *X. fastidiosa* flourishes within the

Continued on page 73



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PINOT NOIR–

Shedding its formidable reputation

By Eleanor & Ray Heald

In this exclusive report, ***PWV*** interviews six California and four Oregon producers to determine key issues involved in production of Pinot Noir — a wine with a formidable reputation.

The interviews, discussion, and tasting of the 1990 vintage revealed that Pinot Noir is shedding its perception of a notable Old World varietal failing to adapt to New World conditions. United States west coast winemakers have set Pinot Noir on a new path to greatness.

Pinot Noir table wine producers in both California and Oregon tend to be small. Robert Mondavi Winery (Oakville, CA) is the largest producer of Pinot Noir in the U.S., but crushes less than 10% of the quantity used by Domaine Chandon for sparkling wine production. By comparison, Saintsbury, the fourth largest Pinot Noir producer crushes slightly more than 300 tons/year.

Winemakers interviewed by ***PWV*** agree that the quality of Pinot Noir made quantum leaps in the last decade with plantings in correct sites offering proper climate and *terroir* in conjunction with concentration on clonal diversity, divided canopy, and vine density. These producers have now turned their focus to cellar practices which have turned up the quality level to new heights.

Managing phenolics

"Everything you do in the cellar with Pinot Noir centers around managing phenolics," contends winemaker John Montero (Bouchaine Vineyards, Napa, CA). "It begins with picking mature grapes to avoid green fruit, and whether or not a winemaker chooses to add stems to the fermenter. If stems are the choice, they must be mature to avoid inappropriate phenolic characters.

"Whether the choice is pumpover or punchdown, it must be done in the most gentle manner possible, because you don't want to extract bitter phenolics from the seeds. This is the reason it's important that a Pinot Noir producer have a gentle destemmer-crusher. It's integral to managing phenolics."

Don Kautzner (Adelsheim Vineyard winemaker, Newberg, OR) echoes Montero's sentiments and adds, "Pinot Noir should not be a tannic monster. We need to produce subtleties in Pinot Noir with good tannins, balanced with flavorful fruit. The best examples of west coast Pinot Noir have found this happy medium."

Winemakers agreed that whole cluster fermentation has the dual benefit of adding spicy flavors from stems and slowing down the fermentation. Montero only chooses whole cluster methodology when the stems are sufficiently mature. He maintains that he also likes the slight carbonic character derived from whole cluster fermentation.

Cold soak

This practice, touted by Burgundy winemaking consultant Guy Accad, is a nonalcoholic extraction. Accad maintains that the seven- to ten-day cold soak technique extracts positive flavor components from the grapes which are different from those obtained in an alcohol environment. Accad stresses that with the use of a cold soak, pressing should occur as soon as primary fermentation completes so that limited alcoholic extraction takes place.

Because Ken Brown (Byron Vineyard & Winery winemaker, Santa Maria, CA) uses some native yeast, he believes that this approximates some of the positive virtues of Accad's method. "It takes a minimum of three days for our fermentation to kick in," he reports. "I've prolonged the period by adding about 35ppm SO_2. If not relying on native yeast, the must will be held at 40°F to 45°F for four to six days with 35 ppm SO_2, then inoculated with the appropriate yeast.

"The total maceration time will range from 14 to 22 days, depending on extraction characteristics. Wines will be pressed at dryness, thus avoiding post alcoholic fermentation phenolic extraction problems."

From a color standpoint, many winemakers reject SO_2 extraction because west coast fruit has ample color. The prevailing opinion is that SO_2 reduces the vineyard personality of Pinot Noir.

While some may consider the Accad technique 'new wave,' winemakers interviewed judged that it was not. Given the naturally cool cellars of Burgundy and the preferred use of indigenous yeast, most red Burgundy has traditionally receive a four-day or longer cold soak before fermentation starts.

Reserve labeling

Robert Mondavi Winery (Oakville, CA) winemaker Charles Thomas notes that Reserve distinction comes from vineyard sourcing. "We have several consistent candidates," he reports. "We tend to direct this fruit to our small tanks and use a punchdown technique to manage the cap."

"For Saintsbury Reserve, it's definitely a lot selection," Saintsbury's (Napa, CA) winemaker Bill Knuttel explains. "It's based on fruit concentration. Methodology is the same." This is also the policy at Bouchaine and Byron for Reserve bottlings.

Apart from a Reserve bottling, Saintsbury employs a technique different from other producers interviewed. Once the malolactic fermentation, which takes place in barrel, is complete, barrels are topped, bunged, and rolled. The wine remains undisturbed for seven to nine months.

"The trick is getting the wine to barrel as quickly as possible," explains Knuttel. "Once ML is complete, if the fermentation was clean, the acidity good, and the SO_2 properly adjusted, there's no reason to be concerned about the wine for several months.

"From Saintsbury's viewpoint, it's a great labor-saving technique because we don't have to top the barrels. It also saves space and overhead, but the best thing is that the Pinot Noir is protected for an extended period. Pinot Noir is fragile, so the more you top it, the more chances you take with oxidation and infection."

Other winemakers interviewed state that the wine is barrelled on light fermentation lees. "Sometimes we take the wine directly from the fermenter to barrel," says Fred Scherrer of Dehlinger Winery (Sebastopol, CA). "The press wine will get racked off the'mud' in a day or two.

How hot is hot?

The question was raised about the possibility that peak fermentation temperatures may be an overplayed issue. "Usually, it's the upper 80°F range," offers Brown.

"At Rex Hill Vineyards (Newberg, OR), we're using 1½-ton fermenters and we're making efforts to maintain a reasonable peak," winemaker Lynn Penner-Ash states. "We're peaking around 90°F." Sokol Blosser Winery (Dundee, OR) winemaker John Haw also prefers a peak about 90°F.

At Dehlinger Winery, four- to five-ton fermenters are used. "We pay attention to temperature and like to start a fermentation relatively cool," Scherrer reports. "This way, we don't have to do a lot of cooling later on."

"On a ripe, intense lot, tank size does not make a lot of difference" Thomas contends. "For less intense lots, the size of the fermenter is of ultimate importance. But if you ask me what I'd choose, if I had the opportunity to build, I'd say small tanks, less than eight feet tall. In terms of winemaking, the cost pays off. For larger fermenters, we like them to be as wide as they are tall. Ultimately, what really matters is cap thickness."

All participating wineries, except Saintsbury, manage the cap with a punchdown technique. Because of fermenter size, Saintsbury irrigates the cap. At Sokol Blosser and Robert Mondavi Winery, depending on lot size and logistics, both punchdown and irrigation are employed.

"If we have a ten-ton lot," says John Haw, "we'll do one five-ton lot with punchdown, and the other half with irrigation as an experiment. For the most part, I like the irrigator. It's more efficient and with a progressive cavity pump, it's very gentle. We've experienced excellent fruit retention."

The B word

"It's sometimes worrisome when you open a bottle of Pinot Noir and you get the note of Brettanomyces or tar," Thomas affirms. "After five or ten minutes airing, however, good Brett elements can change dramatically and offer complexity and spice."

Thomas explains that with Robert Mondavi Pinot Noir in the past, where some Brett growth has been detected, overt and undesirable characters peak in four months to one year, then diminish over time. Integration does occur after a year or two in the bottle.

"During barrel ageing and before bottling, Brett character is undetected by nosing the wine," Thomas continues. "If the wine is plated, some small populations of Brett are evident. What we find is that if you have a Brett cell, or two or three, you might as well have several hundred.

"We have seen that Brett growth is associated with residual sugar measurable by enzymatic analysis, minute quantities less than a gram/litre. But there are many other carbon sources for Brett to metabolize, as we have seen in a few instances where Brett growth in the bottle could not be explained by RS alone."

Barrel ageing/filtration

Debate and experimentation continues around type of oak cooperage. Most producers prefer tight-grained Burgundy coopered barrels with medium to high level toast.

"Time in oak is still up for much discussion," Montero contends.

At most wineries, budget size dictates the amount of new oak. "It's a personal, stylistic element even if budget is not a factor," Brown maintains.

"The other problem is that we don't really understand all the interaction between oak and Pinot Noir," Knuttel explains. "There just hasn't been sufficient research."

"In the past, once ML completed, we used to add SO_2 in the tank," Brown reflects. "Wine went to barrel with SO_2. The newer theory, supported by solid research, suggests we're better off if we do the SO_2 addition about a week after the wine has been barrelled."

Knuttel explains that the wine is inoculated for ML in the tank and then transferred to barrel, where it finishes ML. No SO_2 additions are made until ML completes.

ML inoculation after primary fermentation to prolong the ML fermentation period, is the method preferred by interviewed winemakers. "The interaction between the process and the barrel makes the wine more complex," Brown emphasizes.

"Any processing step is a negative," Knuttel stresses. "If the wine needs it, then do it and filter gently and correctly." It was suggested that no more than medium pads should be used. DE or coarse pads are preferred.

On a related issue, aeration of Pinot Noir is a negative unless there's a problem with the wine and the solution is aeration.

Geographic signposts

If the wine tasting that accompanied the discussion of Pinot Noir revealed anything, it was that it is becoming more and more difficult to determine the region of origin of Pinot Noir in general. "We've stopped making blind guesses about geographic origin," Montero contends. "In fact, we've stopped caring about it in all technical discussions."

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DON KAUTZNER, WINEMAKER

Stylistic goals at Adelsheim center around the individual characteristics of each vineyard. Don Kautzner strives to let the vineyard express its qualities without the winemaker getting in the way. Vines (UCD-5 clone on its own roots) averaging 17-years-old located in Yamhill County, OR, consistently develop a complex spicy element that tastes integrated in the wine.

Fruit is picked between 22.5° and 23.5° Brix, 0.65 to 0.85 TA, and 3.3 to 3.4 pH. SO_2 is added at the crusher at 50ppm. To add body and structure to the wine, 10% to 30% whole clusters are employed. The remaining clusters are destemmed, but not crushed; 10% to 30% of the berries are unbroken, which results in more forward fruit flavors.

Native yeast has been used successfully for over ten years. This method allows the juice a two- to four-day cold soak, and seems to add complexity to the wine.

During fermentation, the cap is punched down twice daily. In open-top, five-foot high tanks, fermentation lasts seven to 14 days reaching a maximum 92°F. Wine taste after fermentation completes, determines the time of pressing.

Wine is barreled on light lees within two days of pressing into 60-gal new- to five-year-old Allier and Troncais cooperage for ten to 12 months. During barrel ageing, the wine is racked once and 20ppm free SO_2 is maintained.

When needed, fining is done with egg whites (two to three/barrel). Filtration prior to bottling is avoided unless the wine needs it. The wine is bottle-aged 20 months before release.

BETHEL HEIGHTS VINEYARD

SALEM, OR
TERRY CASTEEL, WINEMAKER

Accentuating the fruit and spicy character of the grapes grown at Eola Hills in the central Willamette Valley, OR is the primary goal at Bethel Heights.

Vines averaging 15 years of age are primarily self-rooted UCD-5, 1A, and one upright clone (of unknown origin). While picking decisions are made principally on taste, harvest parameters are 21° to 23° Brix, 0.7 to 1.0 TA, and 3.15+ pH.

Depending on the vintage, berries are retained as whole as possible. In a ripe vintage, up to 25% whole clusters are used. Within three to five days after crushing a variety of active-dry yeasts (Prise de Mousse, 796, 71-B, Wadenswil, and Assmanhausen) are used as fermentation inoculums. Each vintage, natural yeast has been used in experimental lots. Casteel judges that the wines have been very good, but no better than inoculated lots.

Fermentation completes in six to eight days in 1,600-gal (10-ft. x 5-ft. closed-top fermenters. Pumpover is done twice daily just long enough to moisten the cap. Maximum fermentation temperature reaches 90°F.

Wine is pressed 10 to 12 days past dryness and barreled the next day. First SO_2 addition of 20ppm is made after ML completes. Typically, two rackings are done during the 18 months in new- to six-year-old Allier and Troncais barrels. SO_2 at 20ppm is added each time the wine is moved.

If necessary, fining is done with egg whites (two to six/barrel). The goal is to bottle unfiltered wine, but unstable or unclean lots are filtered. The wine is bottled-aged three to four months before release.

BOUCHAINE

NAPA, CA
JOHN MONTERO, WINEMAKER

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At Bouchaine Vineyards, John Montero strives to augment the ever-present red berry fruit showcased in Carneros region Pinot Noir. Enhancement of the spicy and earthy attributes is also important. As an adjunct, he desires to produce a wine with phenolics enhancing texture and richness without increasing bitterness or harshness.

The Pinot Noir grapes are 100% estate grown. The majority of the 10-year-old vineyards are Martini selections yielding very fruity wines. Grapes are picked primarily on flavor, followed in close succession by uniform color, berry softness, stem color, and lignification. At harvest, Brix levels range 22.5° to 24.0°, 0.80 to 1.0 TA, and 3.2 to 3.4 pH.

Until 1992, berry crushing was 100% on destemmed fruit. For the 1992 vintage and beyond, an Amos destemmer is employed, yielding about 50% whole berries on destemmed fruit. About 20% to 30% whole clusters are fermented to extract spicy elements from the stems and slow the fermentation rate. Stems are not added back because they produce excessive bitterness.

Within 48 hours after crushing, juice is inoculated with Assmanhausen liquid yeast. In 1991 and 1992, a four to five-day cold soak was employed prior to innoculation for many lots. In the past, natural yeast fermentation experiments failed due to Brettanomyces infection.

During fermentation in 10x10x5-ft. fermenters, reaching a maximum of 90°F and lasting five to seven days, the cap is punched down two to three times daily for 30 minutes. The wine is pressed two to three days after dryness. Once ML induced by the MCW strain completes, SO_2 at 40ppm is added and the wine is barreled on light lees in 20% new Allier barrels for 12 months. SO_2 at 0.5ppm molecular is maintained in barrel. Racking is done once in spring.

If the final blend needs fining, one to two egg whites/barrel or 50 to 100g/1,000gal caseinate are used. Racking is done in two weeks. One or two days before bottling, the wine is DE-filtered. A 1.0µ depth cartridge is ahead of the filler on the bottling line. An 18-month bottle ageing precedes release.

BYRON

SANTA MARIA, CA
BYRON 'KEN' BROWN, WINEMAKER

At Byron Vineyard, Ken Brown's stylistic goals center around growing and producing Pinot Noir possessing concentration depth without being overbearing, while at the same time reflecting both regional and specific vineyard characteristics. Aromatics and texture are the primary focus.

In the Santa Maria Valley, 20-year-old vines are planted at standard density on weak soils in a very cool climate with a long growing season. New vineyards are planted at higher density (trials of 1,500 to 4,300 vines/acre) with a vertical trellis system. Harvest parameters are generally in the range of 22.7° to 23.2° Brix, above 0.90 TA, and 3.3 or lower pH.

To add both aromatics and mid-body texture, approximately 30% to 40% whole berries are fermented, and 15%

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to 20% whole clusters are employed only when stems do not taste green or vegetative.

After a four- to six-day pre-soak at 40° to 45°F, lots are inoculated with either active-dry Assmanshausen, Burgundy, or Prise de Mousse yeast. Native yeast fermentations are also employed on selected lots.

During fermentation (reaching a maximum of 88°F), and the active stage lasting seven to eight days, in closed-top (6-ft. diameter and 7-ft. tall with a 48-inch top door) fermenters, punchdown is done three to four times daily. Pressing is done at dryness for a total maceration period of 14 to 22 days. ML completes under the influence of the MCW strain. SO_2 is added post-ML at 35ppm.

Wine is transferred to new- to five-year-old French oak barrels on light lees. The wine is racked once in spring during a barrel regime extending 11 months for the regular bottling, and 17 months for the reserve. In barrel, SO_2 levels are maintained at 15 to 20ppm free.

If the wine needs fining, two to four egg whites/barrel are used. After 45 days, the wine is bottled directly from the fining/settling tank, and given seven to twelve months of bottle rest before release.

DEHLINGER

Sebastopol, CA
Fred Scherrer

At Dehlinger, the winemaking team guides estate-vineyard fruit into two products. One is the estate Pinot Noir styled to be a full, mouthfilling wine with strong personality and ripe, black cherry fruit. Creamy oak significantly contributes to the balance and finish. This wine requires and benefits from longer barrel and bottle ageing to develop properly.

The second bottling labeled 'Lot #2' is a wine exhibiting the more attractive facets of a youthful Pinot Noir. Bottled sooner than its big sister, it shows less oak in its personality and is ready to drink earlier. It has lighter color and weight than the estate wine, and sells for a lower price.

After a number of years of experience with this program, the Dehlinger staff thinks that perhaps a three-tier product system (rather than the two-tier system currently in place) would better match the vineyard's personalities to the bottled products.

Vineyards are located between Sebastopol and Forestville, CA. Separate plantings average 18, 11, and 4-years-old. Vines are planted on AXR-1 and the desired ripe, black cherry flavors are achieved at close to 14% potential alcohol. Additionally, a highly variable soil profile impacts the vineyard to yield highly varied wine personalities in any given vine row. Therefore, cultural operations and harvesting follow soil variations rather than row lines.

Turgor, pulp texture, and grape flavors are the principal harvest parameters. On average, Brix levels at harvest are 24.5° to 25.5°, with 0.70 to 0.90 TA, and pH 3.25 to 3.35.

For complexity and balance, about 20% whole clusters are often incorporated in the fermenter, along with a high proportion of gently destemmed whole

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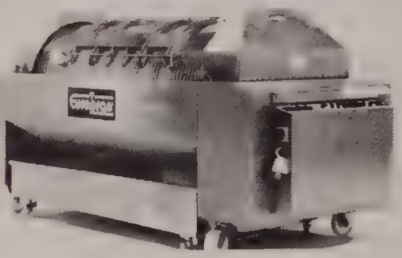

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berries. The latter seems to intensify cherry flavors when young, and affords reduced seed extraction.

Scherrer evaluates success with natural yeast as very good. While they have used indigenous yeast sometimes, commercially available yeast (Prise de Mousse and Pasteur Red) have been the most commonly used strains at Dehlinger in the past two years.

In six- to seven-ft. diameter, four to five-ft. high open-top fermenters, punchdown is done one to three times daily to break up the cap and mix the must. The temperature generally peaks near 90°F during the seven to 11-day fermentation. Pressing occurs at dryness, which is about 13.5% to 14% alcohol.

ML inoculation strategies vary. The MCW strain is used if MLF has not begun by Leuconostoc present in previously used cooperage. If the spontaneous ML culture looks good, it is spread around to other puncheons.

The newly pressed wine typically goes to 500-L puncheons within 24 to 36 hours of pressing. The purpose of this is to go to the mix of Allier, Troncais, and Vosges puncheons with the light lees. After MLF completes, 25 to 40 ppm SO_2 is added.

A February racking retains some light lees, while an August racking attempts to remove all remaining lees. Following the August racking, the estate wine is returned to puncheons, while the Lot #2 product goes to upright oak tanks.

The Dehlinger staff combines some of the fermentation lots destined for the same product at each racking, gradually building the final blends. Experimental lots are kept separate for as long as reasonable. The goal is to balance the wine through blending (an 'additive' process), rather than employing a 'subtractive' process like fining or filtration.

Scherrer details that Dehlinger has practiced many filtration schemes over the years. Although the winery staff tends to prefer unfiltered wines, there are many factors considered regarding clarification and filtration practices prior to bottling. Scherrer prefers to remain flexible concerning these elements. "We get a lot of feedback from our customers, and we must consider their preferences too," adds Scherrer.

Lot #2 is bottled during its second winter and receives two to four months bottle ageing before release. In the following spring or summer, after nearly two years in the cellar, the estate wine is bottled and receives an additional four to five months bottle rest before release.

ROBERT MONDAVI

OAKVILLE, CA
CHARLES THOMAS, WINEMAKER

At Robert Mondavi Winery, Charles Thomas looks for wines with good concentration and fruit expression. Simultaneously, the wine should have ample tannin for youthful color and good ageing potential with the silkiness and elegance associated with great Pinot Noirs.

At release, a wine with notable berry and red fruit characters complexed with spicy as well as toasty oak is desired.

Grapes are sourced from locations in the Carneros and the foothills both west

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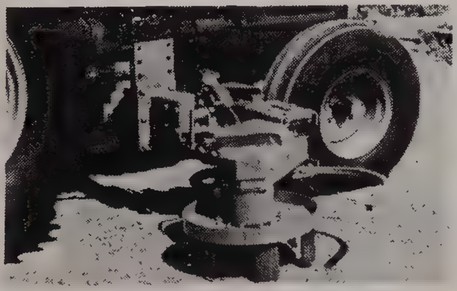

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and east of the city of Napa. Vines average four to 25-years-old and unfortunately, most are on AXR-1 rootstock.

Thomas believes that Mondavi has the beginnings of success with its own Carneros vineyards and maintains that these vineyards are the wave of the future for Mondavi Pinot Noir.

Vine appearance, berry color, and Brix/acid ratios are paramount harvest parameters. Generally, Brix levels are about 23°, with 0.98 TA, and pH about 3.2 or slightly less.

To add attractive fresh berry fruit, there's a 10% to 15% whole berry element in most of the lots. When possible, this level can reach 25%. Thomas has experimented with whole clusters and explains they can add a heightened complexity and fruit intensity in carefully chosen lots, but he prefers to avoid stems because of their bitter and stemmy negatives.

Within 24 to 48 hours after crush, inoculation with active-dry Prise de Mousse yeast is done. Experiments with indigenous yeast have been successful and yielded a sound, complex product.

Due to the array of fermenters available, the cap is managed by punchdown or sprinkling. Punchdown is preferred, followed by pumping over with a cap irrigator. All methods are employed twice daily at one minute/ton.

Maximum fermentation temperature is 85°F (low 90°s in the cap) in a fermentation lasting 3½ days. Skin contact of 15 to 18 days is followed by pressing.

ML is induced with a 'house' strain.

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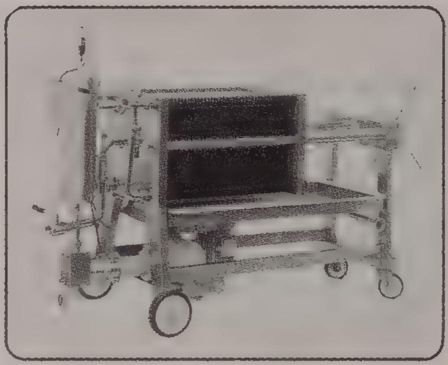

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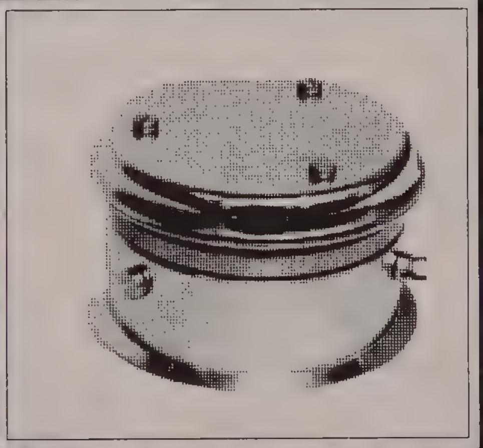

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Once inoculated, the wine is transferred to French oak barrels on light lees for 10 months. Ideally, the wine is racked barrel to barrel by gravity once or twice during the barrel regime. The blend is made after six months barrel ageing.

If needed, the wine will be fined with one to three egg whites/barrel. It will be racked in four to five weeks. At bottling in November, one year post-harvest, the wine is given a clean racking and bottled through a 22µ screen. It is given six months bottle rest before release.

REX HILL

Newberg, OR
Lynn Penner-Ash, winemaker

At Rex Hill, Lynn Penner-Ash allows the vintage and fruit levels to guide her cellar techniques. If the vintage offers light, seductive fruit, less new oak is used, and the total ageing time is reduced. Heavy toast barrels are used in greater percentage when the vintage yields high phenolics and complex anthocyanins.

Penner-Ash is quick to note that, with Pinot Noir in some vintages, she just sits on her hands and lets the wine decide what style it wants to be.

Self-rooted vines (Pommard and Swiss clones) grown in the Willamette Valley are slightly older than 10 years. Long, cool ripening offers flavor development at 21° Brix in some years, but not until 25° Brix in others. No matter what sugar levels afford maturity, the fruit is silky and elegant with cranberry qualities. On average, picking is done between 22.5° and 23.5° Brix, with pH around 3.3.

About 70% berry maceration of the fruit occurs. Equipment and operation at Rex Hill don't conveniently allow whole cluster fermentation. Adding back stems is a non-issue since Penner-Ash details that stems in Oregon are rarely fully mature. SO_2 at 25 to 30ppm is added at the crusher.

Twelve hours after crush, active-dry Prise de Mousse yeast is added as the inoculum. Natural yeast experiments have not been done.

The cap is punched down a total of three to five times during the 10-day fermentation to break up the cap slightly. Maximum fermentation temperature reaches 90°F in 4x4x4-foot wooden bins with liners. A variety of ML strains are used. The wine is pressed at dryness after a total maceration period of 10 to 24 days.

Wine is transferred to a mix of 50% to 75% Nevers, Allier, and Troncais barrels with light lees for a total of ten months. One racking is done after three or four months.

In some years, the wine is fined while still very young in barrel with egg whites or gelatin. If fining is done in barrel, racking off the fining agent doesn't occur for at least one month. The wine is allowed to settle two to three weeks in tank, then if necessary, a course pad filtration completes the clarification process.

Bottling is done in September, following harvest, and the wine is given 12 to 18 months of bottle ageing before release.

SAINTSBURY

Napa, CA
William Knuttel, winemaker

Three styles of Pinot Noir are produced at Saintsbury: Garnet, a fresh, forward wine, drinkable when young; Carneros Pinot Noir, the 'regular' bottling, a more serious, complex, ageworthy wine; and a Reserve Pinot Noir. Bill Knuttel explains that these three styles of wine co-exist in Carneros, and that they are in recognition of what the vineyard sources have to offer each year.

Saintsbury purchases approximately 80% of its Pinot Noir from growers whose vines range in age from three to 20 years. In general, Brix levels are 22.5° to 23.5°, depending upon the vintage. The primary consideration is the fruit's physiological ripeness; Brix, TA, and pH are secondary, although still important.

Whole cluster fermentation is avoided because it contributes too much of a carbonic, stemmy character to the wine. A gentle destemmer/crusher is used, along with a progressive cavity must pump to minimize solids generation. About 30% to 40% whole berries are retained. No stems are added.

All of the fermenters are closed top and jacketed. Once the fruit is in the fermenter, it is cooled, if necessary, to approximately 60°F. After two days of this quasi-cold soak, a fairly small inoculum of active-dry Pasteur Cham-

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pagne or Prise de Mousse yeast is added.

During peak fermentation, the tanks are irrigated three times daily. As the fermentation slows, so does the frequency of irrigation. The duration of each irrigation is adjusted, according to the volume of the fermenter.

Maximum fermentation temperatures are between 85° to 87° F. Fermentation completes in five to six days, but a total skin contact time of 12 to 18 days is generally desired. Cap management is critical during post-fermentation maceration, and the headspace is carefully blanketed with CO_2.

Two strains of malolactic bacteria are used. Inoculation is after primary fermentation, either in fermenter or barrel. ML finishes in barrel, usually in two to four weeks. SO_2 is added after ML is complete.

The barrel regime begins as soon as possible after pressing. Free run wine, which is usually quite low in solids, goes to a blend of new to three-year-old barrels. The barrels are all French oak; a mix of Nevers, Allier, and Vosges woods with medium to heavy toast levels. The press wine is barreled separately. As discussed in the introduction, once ML is complete, the barrels are bunged and rolled, and remain in place without rackings for seven to 11 months, depending on the blend.

The wine is seldom fined. Filtration is not practiced except for the press wine and/or barrel bottoms. After filtration, the press wine is blended back into the unfiltered free run wine in varying proportions, again, depending upon the blend. All of the Pinot Noir is bottled during the summer, and receives from four months for Garnet, to 15 months for Reserve of bottle ageing before release.

SANFORD

BUELLTON, CA
BRUNO D'ALFONSO, WINEMAKER

A full, rich, extracted wine with aromas of damp earth and forest floor decomposing leaves coupled with flavors of blackcherries and licorice are the primary goals of Pinot Noir production at Sanford Winery.

A tightly structured wine with medium to large tannins and medium to high acidity is also targeted. Pinot Noir with medium dark color with hues in the purple/garnet range are also desired by winemaker Bruno D'Alfonso.

Fruit is sourced from the Sanford & Benedict vineyards in Santa Barbara County. Vines are self-rooted Mt. Eden clone planted 20 years ago in a rocky clay-loam Miocene marine deposit.

Typical harvest parameters are 23° to 24° Brix, 0.95 to 1.0 TA, and 3.1 to 3.2 pH.

The must contains berries that are about 80% macerated and 20% whole clusters. D'Alfonso maintains that some carbonic maceration occurs, contributing to overall fruitiness.

Inoculation with liquid Assmanhausen yeast occurs at the crusher. Experiments with natural yeast have not been attempted.

Open-top 8x8-ft. fermenters are pumped over daily for two hours. Maximum temperature during a seven-day fermentation is 90°F. First SO_2 additions of 60ppm are made after ML, induced

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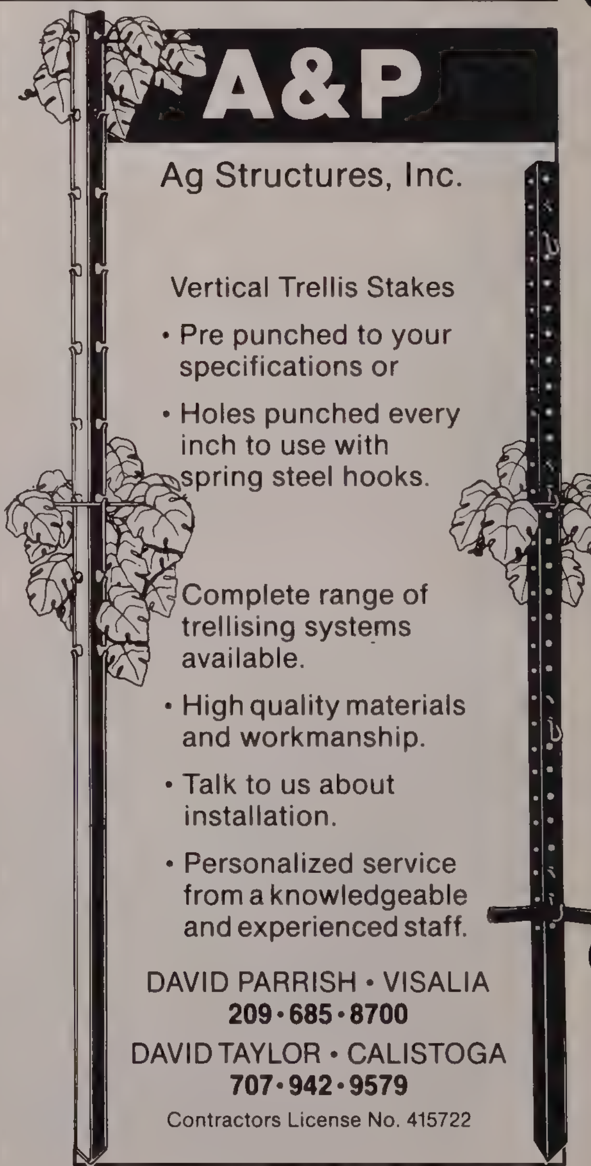
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with the MCW strain, is completed.

Pressing is done 14 days past dryness at 13.5% alcohol levels. The next day, wine goes to barrel in a mix of 25% new and older French oak and remains there for a total of 18 months. Blending and one racking is done after 16 months.

At that time, the wine is fined with two to three egg whites/barrel. The wine is bottled off the finings in March or April, one and a half years past harvest and released fairly soon.

Sokol Blosser

DUNDEE, OR
JOHN HAW, WINEMAKER

Winemaker John Haw contends that the Red Hills of Dundee in Yamhill County, OR, are ideal for full, rich, and complex Pinot Noir. Vines averaging 12-years-old represent a variety of clones, own-rooted in clay loam soil. In any year, from nine to 15 different vineyard blocks allow crafting of a final blend.

Taste is the most important harvest parameter. Mature flavors are achieved at Brix levels above 22.5° with a TA about 0.85, and 3.2 to 3.3 pH.

To achieve increased fruit character and fermentation control, about 30% whole berries are fermented. Whole clusters are avoided because Haw considers them a source of stemmy bitterness.

Inoculation with active-dry Prise de Mousse is done 24 hours after crush. Natural yeast has not been employed.

Fermentation reaches a peak 92°F in a mix of wooden open-top fermenters where the cap is punched down twice daily for about 20 minutes, and closed, five-ton stainless steel tanks where the cap is irrigated. Total skin contact time is 12 to 17 days.

The wine is pressed at dryness with 12.5% to 13% alcohol levels. MLF is achieved by inoculation with an OSU-strain. SO_2 is added at five to 10ppm once MLF has completed in barrel (usually in Spring).

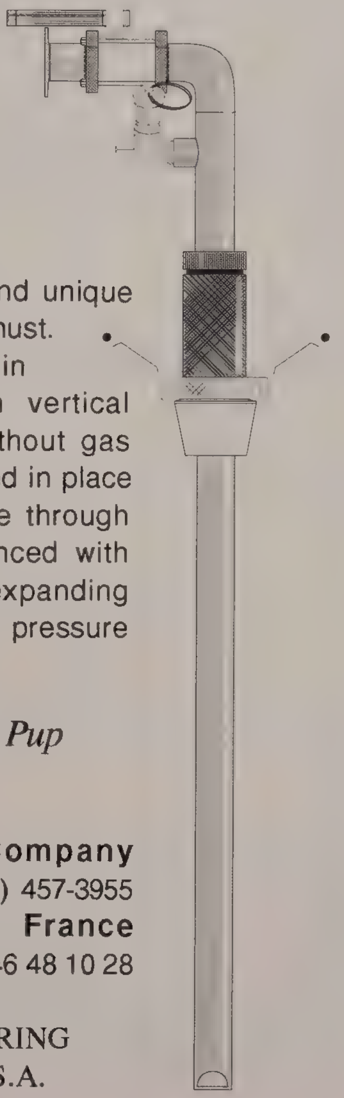
Twelve hours past pressing, the wine is barreled on light lees in 20% new Center of France barrels for approximately ten months. During the barrel regime, wine is racked once or twice with SO_2 levels maintained at five to 10ppm free.

Isinglass fining is done as early as possible. The wine is settled three months before racking off the fining agent.

Wine bottled in September, following harvest, receives 18 to 24 months bottle ageing before release. ■

PWV thanks Bouchaine Vineyards for hosting the varietal review tasting/discussion and the following winemakers for participating: Don Kautzner, Adelsheim Vineyard (Newberg, OR), John Montero and Eric Fidel, Bouchaine Vineyards (Napa, CA), Ken Brown, Byron Vineyard & Winery (Santa Maria, CA), Fred Scherrer, Dehlinger Winery (Sebastopol, CA), Charles Thomas, Robert Mondavi Winery (Oakville, CA), Lynn Penner-Ash, Rex Hill Vineyards (Newberg, OR), Bill Knuttel, Saintsbury (Napa, CA), John Haw, Sokol Blosser Winery (Dundee, OR).

Winemakers requested that PWV schedule a second tasting of the 1990 vintage in 1997 including the same participants to discuss ageability. Be assured, the organized PWV publisher/editor has it on his calendar.



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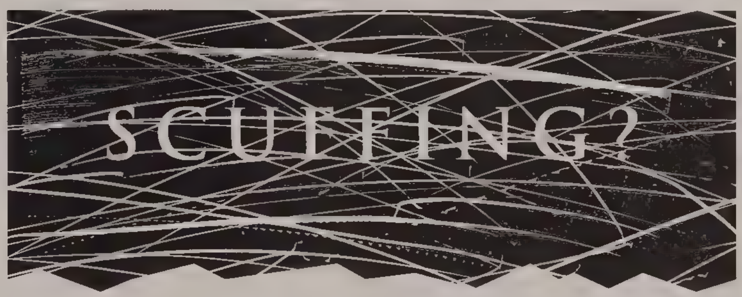

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By Dr. Richard Smart

Diagnosing problem canopies

My previous **PWV**-columns have dealt with the yield and wine quality benefits to be gained from canopy management. This column will highlight a basic first step in canopy management: diagnosis of problem canopies.

You trust your medical doctor to maintain your health by accurate diagnosis. Vineyards can also be diagnosed as to whether or not they have canopy problems. I will discuss 'symptoms' of poor canopies as they occur during different parts of the growing season, and also some other indicators such as disease status and wine character.

The best opportunities to diagnose problem canopies are just before harvest and at winter pruning. With harvest approaching in California, now is a good time to critically examine your vineyard to see whether any canopy changes might be required.

Vineyard canopy assessment

Many vineyard owners and winemakers look at me incredulously when I tell them one can estimate potential wine quality from a vineyard just by looking at it. Yet, it is easy when you learn how, and in fact, with experience, one can do it more or less from a speeding car!

Canopy assessment depends on two groups of canopy elements: those pertaining to canopy microclimate, and those relating to vineyard vigor. We need to understand something of the physiology of the vine during ripening to appreciate why these two groups are important.

It is, I think, a maxim that high quality wines are made from fruit which ripens earliest within any one region. This maxim applies, of course, for any one variety, or clone of variety, within any one region of the same climate. Such wines show more generous flavor and structure at lower, rather than higher sugar levels.

Rapid ripening is caused by a plentiful supply of sugars to the bunches. This, in turn, depends on the production of sugar by photosynthesis, and its distribution in the vine. For example, actively growing shoot tips can draw sugars away from ripening bunches, so that sugar accumulation in berries is slowed. Color, phenol, and flavor levels are also reduced, and pH is increased.

Very large crops can, of course, cause ripening delays, but this is not the only reason (despite what winemakers believe). Delayed ripening is commmonly due to shaded canopies, and also to shoot tips actively growing after veraison. Any factors which slow photosynthesis, such as canopy shade, high air temperatures, or water stress, also delay ripening. The visual assessment of canopies to assess wine quality depends on being able to assess both canopy shading, vine balance, and leaf health.

A vineyard scorecard has been developed to allow canopy judgement by visual assessment, in much the same way that a sensory scorecard is used to assess wine. The vineyard scorecard, as presented in *"Sunlight into Wine"*, is based on eight vineyard elements. Three of these pertain to microclimate, and five relate to vigor.

Microclimate elements include: the proportion of canopy gaps, leaf layer number, and fruit exposure. Those related to vigor include: leaf size and color, shoot length, lateral growth, and growing tip activity.

The scorecard has been revised several times, and has been extensively field-tested. The scorecard, or variants of it, is used by commercial wineries to identify vineyards which produce quality fruit, and also to schedule harvesting of vineyards with similar fruit quality. The scorecard is also now being developed into vineyard quality assurance schemes, and used for payment of fruit quality bonuses.

The scorecard was developed after years of tedious vineyard microclimate measurement. The specific inspiration came from research in Bordeaux vineyards in 1980. Working with Dr. Alain Carbonneau of INRA-Bordeaux, I studied some of the famous and not-so-famous vineyards of the region.

We made detailed measurements on Cabernet Sauvignon in Premier Cru vineyards like Chateau Haut Brion, and a range of other vineyards with lesser quality reputations. Almost every other day, we were in the vineyards measuring microclimate and vigor.

We found the biggest difference between these vineyards was not in yield, but in canopy microclimate, and that this was linked to vigor. All vineyards had similar spacing and trellis, and so differences of canopy shading were due to vineyard vigor. There were larger leaves and more leaves from lateral growth on vines with higher vigor which caused shade. The vineyards of high quality reputation were those with more open canopies, and the lower quality ones were of higher vigor and more shade.

After having made literally hundreds of thousands of light measurements in grapevine canopies, we realized that measurement was not necessary! Canopies with about 40% gaps have most of the fruit and leaves well exposed to sunlight. All we have to do is look at the canopy and assess the proportion of gaps, the fruit exposure, and the leaf layer number. Then we know if shade is causing quality problems or not. This can be done using a scorecard.

The scorecard can be readily learned, and is simple and quick to use. The best time to use the scorecard is between veraison and harvest. One modification which has been found necessary in some dryland vineyards is to include another physiological character which describes leaf health. Thus, canopies with leaves damaged by drought, leading perhaps to defoliation, can be scored down.

Other indications of shaded canopies

There are other methods to assess canopies presented in *"Sunlight into Wine."* The point quadrat technique uses a thin metal rod which is poked into the canopy. Contacts with leaves and fruit are noted, and the results are easily calculated into meaningful values like the percent gaps and fruit exposure, and also leaf-layer number. This is great material for wine bottle back labels!

Another assessment is of patterns of canopy shadow. These are a little more difficult to judge, since the sun should be in the correct position in the sky. If you see a moderate proportion of sun flecks in the canopy shadow, then the canopy is likely okay. If the shadow is dense with no gaps, then you could have trouble.

There are other symptoms of shaded canopies. These include the balance between vine vigor and yield, disease susceptibility, wine composition and quality. Shaded canopies are often excessively vigorous. This is a classical case of the chicken and the egg. Shade causes reduced fruitfulness, which, in turn, causes increased vigor, which, in turn, causes more shade, etc.

Shaded canopies are also more prone to botrytis bunch rot and powdery mildew and sprays do not penetrate well. Sunny, well-aerated conditions help prevent the development of both diseases.

Wine composition and quality can also be a good indicator of canopy shade. Dense, shaded canopies produce wines deficient in color and phenolics, and with high pH and malic acid concentration. Varietal flavor is often suppressed, and for many varieties, the wines are excessively herbaceous.

Shaded canopies can also be diagnosed easily at winter pruning. A subsequent column will address this important topic. We will discuss in future columns how one deals with a problem canopy. Is it sufficient to do leaf removal and trimming, or should the trellis be altered? If so, which is the best trellis to choose? Also, what is the role of rootstocks in devigoration? ■

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SEE US AT ASEV, BOOTHS 334-336

By *Jake Lorenzo*

In the beginning

In the beginning, there was Al Brett at Buena Vista, and Al trained five sons: Don, Steve, Val, Ken, and Charlie.

One day, the bosses said unto Al, "Al, even though it is harvest, even though you and your sons are working more hours than are in a day, even though the grapes are coming in and coming in, you are not to crush until we arrive with the muckety mucks from the Land of Sales."

So Al waited, and Al's sons waited with him. And they waited. And they still waited.

Finally, the muckety mucks from the Land of Sales arrived with the bosses. Al directed his sons to hoist the gondola of grapes. Slowly, ever so slowly it rose, until just at the fulcrum, it sat, not spilling the grapes, but ever so ready to spill them.

Al spoke to his sons. "Sons, follow me," he said, and he took them to town and fed them ice cream. Meanwhile, the muckety mucks from the Land of Sales and the bosses watched the gondola not dump its cargo of grapes. Thus, did Al train his sons.

In the time of Al, there was the house of Sebastiani, which sat behind tall invisible walls, so no one knew what took place there. High on the mountain, in the center of town, was a beautiful paradise known as Hanzell. This was run by Brad Webb, who begat Bob Sessions.

To the east, in the land of Vineburg, were the brothers-in-law Bundschu, who re-started Gundlach Bundschu. Then they had bitter arguments. So John went to Bandiera, and Barney went to Chateau St. Jean, and the land was left to Lance Cutler.

Also in the east was the house of ZD, where Gino Zepponi and Norm DeLeuze had their humble beginnings. Then they journeyed to the land of Napa, where Norm moved to the Silverado Trail, and Gino begat the first house of Sparkling Wine in California. Alas, Gino lost his life on the roads in the Land of Sales.

In the meantime, Buena Vista's Al Brett was lost and his sons were scattered throughout the Valley. In the center, Don Brett planted the vines that became Hacienda, which begat Crawford Cooley and Steve MacRostie.

The house of Sebastiani continued to live behind the invisible walls, so no one knew what went on there, but rumblings were heard. And the bosses at Buena Vista sold to men from the Land of Sales, who in turn, sold to people from a German drug company.

To the west, came Prince Arrowood, who had studied at the feet of Rodney the Strong. The Prince began Chateau St. Jean and took one of Al Brett's sons, Charlie, to run his kingdom. And Charlie ran it so well that he left to run his own kingdom at Haywood. He turned Chateau St. Jean over to his brother Don, who had started the vineyards at Hacienda.

Also in the West came the brothers Lee, who hired Al's other three sons, Steve, Ken, and Val, to run their kingdom. And they thrived even though they lost Ken early. But they made up for his loss with the adopted sons Mark and Jeff.

Between the lands of Chateau St. Jean and Kenwood, the kingdom of St. Francis began. This kingdom had none of Al's sons to help, and so foundered until the coming of Tom Mackey.

Farther up the road, lay the Grand Cru, owned and run by Bob Magnani and Al Ferrara, who wisely hired Tracey Toovey to run their kingdom. Tracey came from Buena Vista (after Al, but before the German drug company). They prospered, until they sold to the Baron of Bread, Walter Dreyer, who slowly lost market share until the brave Tracey was mur-

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dered, and Grand Cru was gobbled up by the Bronco.

Meanwhile, numerous small kingdoms were started. Their names were Laurel Glen, Matanzas Creek, Ravenswood, and Richardson. Without noticing what was happening around them, the land changed. The apples left the land, and the pears, and prunes. Soon there was nothing but grapes. Grapes and tourists.

In the center of town, the invisible walls of Sebastiani tumbled down, the result of a brotherly battle like Cain and Abel. One brother was left with the kingdom, while the other moved to the far land of Schellville to begin Viansa. Once Schellville was graced by the kingdom of Viansa, it attracted satellites called Roche, Cline, and MacRostie. That left Crawford and Hacienda which were gobbled up by the Bronco.

Haywood, along with Herr Stemler from the Land of Alexander, was gobbled up by the German drug company. Al Brett's son Charlie was cast adrift to wash up on the shore of the land of Benziger.

Meanwhile, Chateau St. Jean was left with Al's son Don, but was sold to the Japanese liquor house of Suntory. So Prince Arrowood left to begin his own kingdom, called Arrowood.

Nearby, Kenwood lost Al's son Steve, who went to the land of Hanna. Steve eventually left there and the business of wine. Al's remaining son, Val, left Kenwood and drifted until he too arrived on the shores of the land of Benziger where he now runs the house of Vallejo.

St. Francis has sold, but retains the services of the trusted Tom. Landmark has moved in, after being tossed out of their native land by encroaching housing tracks. Matanzas Creek bought its way out of the Valley and into the County. Laurel Glen grows with the trusty Ray Kaufman, friend to Lance Cutler.

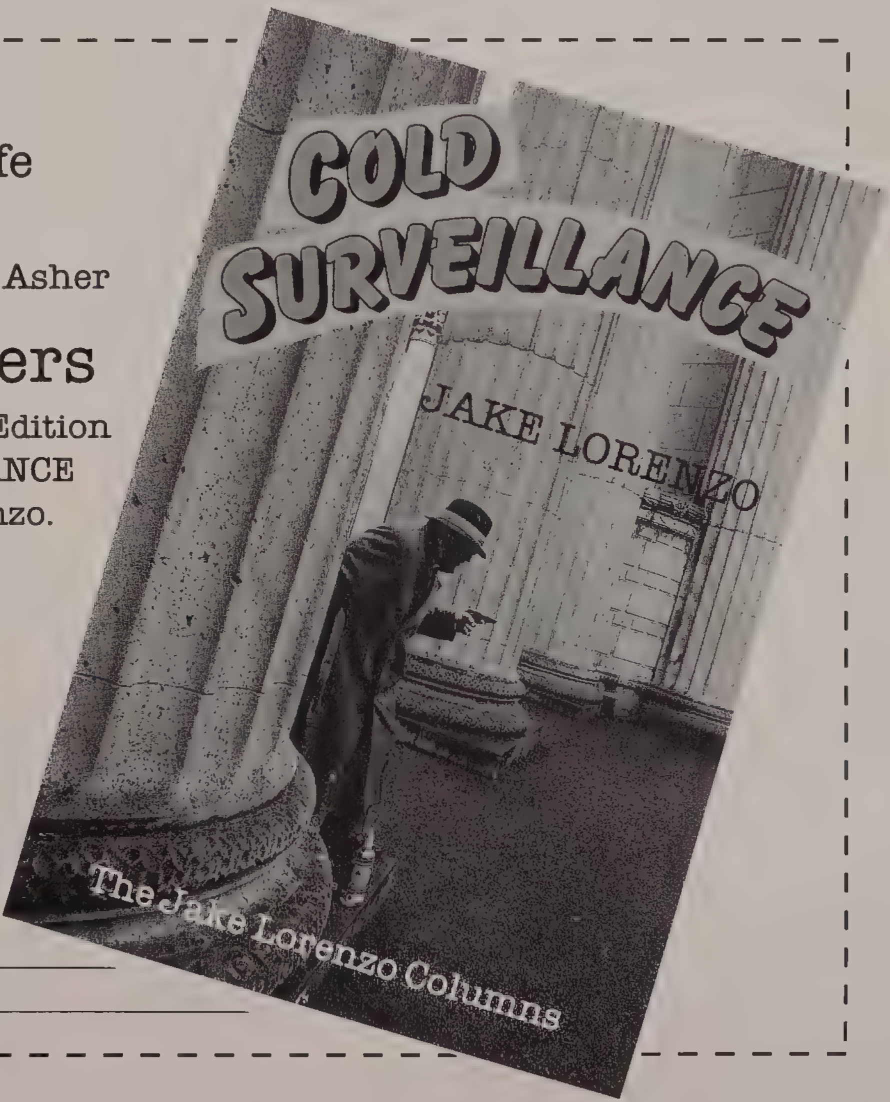
Wellington blossoms, started by father and son who escaped from the land of Sebastiani, when the wall tumbled. Kunde prospers as they use the grapes once sold to Sebastiani. B.R. Cohn waves his banner on the highway.

Ravenswood has moved into the house of Haywood, whose name was lost to the German drug company. The good Little John Kemble was lost to the land of New Zealand. Hanzell clings to its paradise, due only to the tenacious dedication of Brave Bob Sessions. The House of Bundschu is under siege by the dark knights of the police. The Caves of Carmenet have been rented to public stock options.

And there is more, much more, but I have neither the time, nor the stomach to continue.

All this in just 20 short years. Already, Al is forgotten except by his sons. Gino and Tracey bring scarcely a mention. More and more, the bosses and the ravenous Bronco and the men from the Land of Sales control the land.

Jake Lorenzo says you must record the history. You must pass on the truth. We cannot leave the story to Japanese liquor companies, German drug companies, or pretenders to the throne. Our time will come again. One day, a child will hoist a gondola. It will sit with the grapes ready to fall, but not falling, with the crush ready to begin, but not beginning. And we will take a moment to have ice cream with our past. ■



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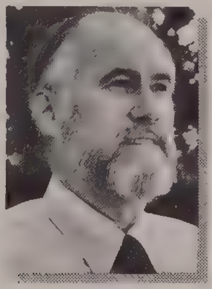

By D.R. Storm, PhD, P.E.

"A giant step for stickum engineering: the universal iron-on patch"

I have always been fascinated by adhesive technology, since my father told me at a very young age that our old horse, Traveller, was destined for the glue factory. For years thereafter, each time a class project required gluing some article or another to paper, I wondered if "Trav" had participated somehow in the production of this sticky substance.

We have passed somehow from the mucilage era to the designer-adhesive that can bond almost anything to any other thing. Label adhesives, for example, seem to have advanced so far technically that, even with a little condensation, labels adhere to cold wine bottles, as if magnetized.

But, the greatest advance in stickum-engineering, in my opinion, is the do-it-yourself iron-on patch. The remarkable benefit of this material is that it saves you from having to discard a favorite t-shirt or antique windbreaker that needs mending.

Whereas the world of off-the-shelf iron-on patches has a maximum color spectrum of four or five, the self-bond ability of this intermediate, magic adhesive cloth makes the patching-match truly infinite. The only skill required is the ability to: (a) plug in an iron; (b) be able to read and follow simple directions; and (c) handle a pair of scissors without cutting yourself.

Like welding of steel, the weld is often stronger than the original material, and so it is with the thermal-induced patch. I haven't finished with wind tunnel and weather chamber testing yet, but thus far, I conclude that the darning needle and the mending basket may end up as obsolete as tin-lead capsules. (The generic name for the patching material is 'interfacing' and the commercial versions I have tried are called 'Heat and Bond' and 'Wonder-Under.' Both are available, I'm sure, at your local fabric store.)

Sanitation, steam, and hot water

Part II

This broadly-based subject has led us, in the previous column, through sanitation principles, and portable and clean-in-place cleaning systems. Part II will discuss:

- sanitizing protocol for wineries;
- boilers and boiler-water quality considerations; and
- interior design tips for reducing sanitation problems.

Sanitizing protocol

The microbiological fauna of greatest concern to wineries are the so-called spoilage group of organisms (bacteria, molds, and yeasts) which can produce off-flavors, aromas, and cloudiness in the finished product.[1]

Wines, unlike most other food and beverage products, are a poor substrate for pathogens because of the naturally occurring ethanol, tannin, and acid components. Thus, mesophilic microbes, the troublesome pathogens of the food service industry, are not likely to be found in wines.

The enological pioneers are reducing and in some cases eliminating the customary industry standard of 30-mg/l free SO_2 at bottling. They are banking on the natural, microbiologically inhospitable environment in wine to produce and maintain stability. This group of winemakers is, I am sure, fastidious when it comes to winery sanitation and cleanliness.

As every winemaker knows, one of the most sinister and effective reproductive methods used by bacteria and yeasts is airborne transit. Thus, meticulous cleaning of transfer hoses, tanks, pumps, and fittings only ensures a temporary microbe-free space. The potential source of outside contamination is always there, even in ultra-clean bottling rooms.

Pasteurizing wines is not a favored technique for ensuring a wine's biological stability in this era of the delicately fresh, grapey flavors and aromas demanded by the wine-quaffing consumer. [The cooked flavors that come with wine pasteurization are only slightly acceptable (maybe) in a palate-masking sherry loaded with wood, flor flavor, and nut essences that make them such a delight to sip.]

Yeast require a temperature of 136°F (58°C) for 15 minutes minimum for destruction.[2] Thus, steam at 180° to 200°F or hot water at 150° to 180°F (at the nozzle) would provide the necessary cell-protein-denaturing heat.

Most bacteria require slightly higher temperatures and duration of heat for complete inactivation and mortality. Performance criteria used by standards laboratories for testing the effectiveness of sterilization employ *Bacillus stearothermophilus* spores, which require a minimum of 240°F for 15 minutes or 280°F for one minute.[3]

The published safety factor for temperature and duration for microbial activation is somewhere around two.[ibid] Wineries never will have a thermophylic bacterium as a resident but it is interesting to note the thermodynamic assault that is required for a complete kill of the 'some-like-it-hot' bug.

Steam temperatures exceeding 212°F at atmospheric pressure can be achieved only under a pressurized boiler system or self-contained, enclosed autoclave. Thus, non-pressure vessel (portable) steam generators (discussed last issue in Part I), are limited in the end-of-nozzle temperatures they can produce.

An important subtopic related to energy conservation involves the temperature settings for steam and hot water systems. Of all the various ways to conserve energy, the most risky, from a wine production quality control standpoint, would be to lower the thermostat on the steam or hot water generator. (Cold or lukewarm water-washing with suitable detergents may be acceptable for residential clothes washing and to help reduce rising home energy bills, but is a chancy practice when it comes to winery cleanliness).

If you have doubts about the thermal performance of your boiler or hot water system, contact the equipment manufacturer's representative and they will be happy to give it a field inspection. In large wineries with in-house utility maintenance staff, the information on steam and hot water specifications should be readily available from your personnel. A thermometer placed at the business end of a steam or hot water hose also can give you information quickly on your potential microbe-killing power.

For wineries with only a steam supply and mixingvalves (mixes steam with water) at hose stations, properly designed valves have a permanently installed direct-reading thermometer. This allows the operator to set the proper temperature for sanitizing tasks. The valves also are fitted with afail-safe device to prevent the discharge of only steam from the hose. Additionally, the hose should be equipped with a suicide-handle-type nozzle that will shut-off, if dropped. Obviously, the mixing valve temperature and the temperature at the end of the hose will differ by the amount of heat loss in transmission.

Optional equipment accessories can be included with the hot water hose stations to permit the injection of cleaning agents and disinfectants. Needless to say, the plumbing for such accessories must prevent, under all hydraulic circumstances, backflow and the cross-contamination of the potable water supply system.

Finally, training of cellar personnel who will perform the cleaning tasks is important in achieving the levels of cleanliness necessary for specified areas and pieces of equipment in the winery. Limited before and after microbe sampling (using sterile technique) of areas to be cleaned, can be a very persuasive training aid. A few slides prepared for microscope viewing by cellar staff can show graphically what has been left behind, even with conscientious cleaning. Controlling unwanted microbes in the winery is a continuous task that only approaches a perfect rating if it is given proper management attention.

Boilers and boiler water quality

Boilers are very sensitive pieces of equipment and their rugged massiveness belies their requirement for thoughtful and delicate handling.

The winery's mechanical engineering designer generally selects the initial boiler installation to meet both present and future needs. Thus a single boiler is often underutilized for a few years until the winery reaches full capacity. As an option, capacity can be split between two or more units, so that if the timeline is rather long for reaching full wine-production capacity, the single boiler can meet steam and hot water requirements for many years.

During the design stage, wineries would be prudent to have the mechanical designer provide a matrix of performance, life cycle, operation, maintenance history, and capital cost to highlight a potential optimum choice for the winery.

This short discussion of boiler hardware downplays the nuts and bolts aspects, but actual performance specifications highlight some special items that relate to boiler fuel choices and stack emissions and operation.

The winery's available water supply is an important parameter in the proper operation of an industrial boiler. Water hardness usually is expressed as milligrams per liter (mg/l) of total carbonate (calcium or magnesium) hardness. For boilers, when total carbonate hardness exceeds 85 mg/l or five grains of hardness/gallon (in boiler nomenclature), water softening must be included in the pretreatment of boiler feed water. If the soft water guidelines are not followed, scaling of the boiler tubes (calcium and magnesium deposits on the inside of water tubes) occurs, leading to structural failure of the tubes.

The softening process (usually an ion-exchange column which trades calcium for sodium ions) also has a second benefit: Some cleaning tasks become easier, because the cleaning compounds work more efficiently with soft water. Maintenance personnel for established wineries with a hard raw-water supply wage a constant battle to give boilers the required soft water.

Finally, the Clean Air Act amendments of 1991 have set in motion new emission control requirements for industrial fixed sources, including even small boiler installations. Nitrogen oxide and carbon monoxide levels from boiler fuel combustion have been made more stringent for both existing and proposed new or replacement boilers.

Remote wineries, for which natural gas service cannot be provided economically, must rely on propane (LPG) or fuel oil for boiler fuel, which are both very clean burning and may help exempt the winery from expensive emission control devices. The new rules are rather complex with exemptions made only for very small installations. Contact the local Air Pollution Control District in your region to make sure that your proposed new or existing boiler is in compliance. (For the San Francisco Bay region, call 415/771-6000).

Interior design tips for reducing sanitation problems

Part I of this series compared the degree of difficulty in keeping 'new' and 'old' wineries clean.

Old wineries have many cracks, crevices, uneven floors, and virtually uncleanable and inaccessible locations. Little can be done (cost-effectively) in a retrofit sense to old wineries. But a winery can inventory potential 'microbe incubators' on floors, walls, catwalks, and fixed equipment. Then a 'band-aid' program, utilizing the magic caulking and painting materials that are now available, can substantially improve exisiting conditions.

Here is a laundry list of other interior design tips from selected references (listed at the conclusion of this column):

- Three-part resinous floor coatings are now available to seal old concrete floors (surface texture and sealant on top; impact and structural inter-layer; primer underlayer to bond to the old concrete). Anti-microbial additives, that are EPA-approved, also can be added to sealant coat.
- A good rule of thumb is that equipment should not occupy more than 20% of the floor area in any production space to permit the ready movement of people and product, and to allow efficient cleaning of the space.[4]
- All stainless steel should have a minimum polished finish of No. 4, *i.e.*, final polish with abrasives, which corresponds to 150-grit roughness.[5]
- Columns and supports should be tubular or circular in cross section (avoid using floor flanges when attaching winery equipment).
- Mount all fixed stainless-steel wine-transfer piping, so that it will be self-draining. Pipe fittings should be the sanitary type, with long radius bends preferred over tight 90° elbows.
- If angle iron is used for equipment support, mount as inverted L or up-side-down V, not right-side-up L. Likewise with channel and T and I sections, mount upside-down or in such a way that moisture cannot be trapped.

To keep sailors from grumbling about the daily cleaning chores on a ship, someone created an old U.S. Navy cliche, "A clean ship is a happy ship." Slightly modified, the same can be said for wineries: "A clean winery is a smart winery." ■

David Storm is a Consulting Civil and Sanitary Engineer and owner of Winters Winery.

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By R. Corbin Houchins

Risky wine business

NOTE: *This column is excerpted from a seminar on product liability presented at WineTech'93 in January 1993. It illustrates some aspects of the product liability area, but is not intended as a comprehensive guide.*

What is product liability risk?

• Liability versus expense

The danger is unplanned significant expense. Significant harm can occur not only from being found liable to an injured consumer, but also from having to bear the costs of defense, even if successful.

Both liability and costs of defense are insurable risks, but the expense of insurance can be significant. Regardless of the amount of its insurance, a winery will benefit from managing risks by adopting measures designed to make personal injury suits less likely to occur and less likely to succeed.

• Elements of a suit

Practically speaking, all that is necessary to start a lawsuit is an injured person and an identifiable manufacturer of a product which was arguably a cause of the injury.

Generally, liability requires the combination of injury and a defect. The defect can be failure to warn adequately against excessive or improper use of a product that is not defective in itself.

• Defenses

If the product caused the injury, in most cases it is not a defense to show that the manufacturer was careful. Thus, most defense centers on showing that the product is not all that dangerous, that the injury did not occur or was not as serious as alleged, that the harm arose from causes unrelated to the product, or that the warning was adequate.*

Even though exercise of due care is not technically a defense, evidence that the manufacturer was careful and concerned about the well-being of consumers is extremely helpful. If management comes across as decent, the chances of the jury deciding the product did not cause the injury or that the injury was not all that severe improve dramatically. Conversely, a black hat defendant is likely to get hammered, possibly even with punitive damages in addition to the award to compensate the injured party.

Effects of neoprohibitionism

Much product liability law is made in the courtroom. Theoretically, judges interpret the law and juries find what the facts are and apply the law as instructed by the judge. In practice, the law changes over time in the hands of judges and jurors, reflecting developments in community perceptions and values.

At the heart of product liability is a balance between the danger of a product and its social utility. A prime example is the automobile, which if it were not so useful, would have subjected manufacturers to liability for a far wider range of injuries than the courts now compensate. But for the social utility of the product, the law would likely render it uneconomical to make and sell heavy projectiles which travel at lethal speeds within inches of members of the public.

In these times, what the community, including judges and jurors, believes about anything, including the relative social utility and hazard of alcoholic beverages, is profoundly influenced by the media and by special interest groups which enlist governmental agencies and schools in their causes. The interplay between the various media images of wine (glass on a table with food *versus* empty screw-cap bottle in the gutter) will affect the outcome of cases, hence the degree of risk in your legal environment, and hence the cost of doing business.

Traditional sources of liability

• Packaging

Beverage containers hurt people most often by being dropped. Bottles can fall from a defective carton or POS bin and cause injury without breaking, or they can be made or handled in such a way as to break and cut under foreseeable stresses in normal use.

To manage the risks, document your specifications to your supplier and your inspection and handling of the materials in the winery. Go over your purchase order form with your legal adviser to be sure that it is a breach of contract to supply goods that are not adequate for the job. Cartons may arrive in a condition that raises questions about handling. You should have right of rejection, exercisable for a period after delivery to give you time to inspect. Written instructions to employees should specify when the inspection takes place and what the employee is to do or look for.

You can't inspect for everything. It is not current industry practice for the winery to use polarized light to look for bottle stresses. Defects such as 'wings' (thin ligaments of glass connecting opposite sides of the inside of the bottle, formed rather like pulling taffy when the bottle was blown against the mold at an improper temperature) are difficult to see. Eliminating such defects is the responsibility of the supplier and can be the subject of specific warranty in your purchasing arrangements. Consult with your legal adviser before adding specific inspection duties to your quality assurance procedures.

• Foreign matter

Sometimes filler parts fall into bottles, a risk that is managed by performing and documenting proper maintenance and visual inspection of filled bottles.

New bottles present little risk of more spectacular invaders. Suits over mice, etc., for example, generally arise from soft drink and other beverages that re-use bottles, where there are enticing left-overs in bottles waiting to be cleaned.

The only mouse I ever saw in a wine bottle was made of electrical tape, presumably as a joke by a bottling line employee. Incidentally, the stories about the defense witness

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*Note that there are difficult tactical issues for the lawyer defending on the grounds that the product is not hazardous and that the injured person was adequately warned of the hazards. The same issues face manufacturers in deciding what to say about the product.

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who drinks from the bottle containing a mouse skeleton to answer a question whether the taste was affected shouldn't turn anyone's stomach. A re-used bottle has been through a caustic wash and super-heated steam rinse that reduces the trespasser to a skeleton as clean and sterile as the inside of the glass container itself.

- **Dram shop**

If you serve a sample (free or otherwise) to someone who is rendered intoxicated by consuming it or is under lawful age, in most states you are liable for whatever harm that person does himself or others. It does not matter whether the intoxication was also caused by drinks taken elsewhere.

Manage the risk by insurance and by training tasting room employees and anyone who pours for you. Some liquor control agencies offer training programs, and your insurance agent or an industry trade association may have suggestions. The insurance objective is to get a 'dram shop' rider on your general liability policy to cover tasting room and off-site service at festivals or promotions, without being classified as a tavern for rate purposes.

New theories

- **Hazards — known and unknown**

Traditionally, courts have classified alcoholic beverages as not inherently hazardous.

So far as I have seen, there is no case finding that wine is a dangerous product, except when used to excess, and there are numerous cases stating that the dangers of excessive drinking are 'common knowledge.' However, inventive new theories of recovery focus on the adequacy of the warning and question whether consumers actually have as much knowledge of hazards as traditional legal analysis credits them with.

There is a duty to know the product and either to remove known defects or warn about them and instruct in how to use the product safely. Is ethanol a sought-after product feature, as Professor Vernon Singleton engagingly suggests, or a defect which one has a responsibility either to remove or to warn and instruct about in detail?

Sparkling wine comes with a projectile known to be capable of inflicting serious injury. It is technically very easy to redesign the closure to dissipate the pressure harmlessly, but we want the muzzle blast and ensuing report because it adds to the aura of festivity. Feature or defect? Labels now sport warnings of increasing length and specificity. Are they enough, given the arguably willful nature of the risk?

What a winery should say to its consumers about product hazards is very complex. The Supreme Court tells us that putting the government warning on the label does not shield us from liability based on the theory we should have said more.

What do we know about our customers? Even if we know what to say, in what language or languages should we speak to them?

All are questions for you and your legal adviser to ponder, none with a very clear answer at present.

- **Fraudulent promotion and hiding risk**

Adequate warning is a good defense because of the venerable legal proposition that a person who understands a risk

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and voluntarily assumes it should not recover for foreseeable injuries that may result.

A plaintiff's tactic in product liability litigation is to show that the assumption of risk did not occur because the warning, even though adequate in itself, was diluted or vitiated by advertising and promotion which lulled the consumer into a false sense of security. Thus, advertisements, press releases, and other marketing activities, including those of distributors, need legal scrutiny, not only for general advertising and liquor law compliance, but for possible impact on product liability.

Risk management documents

- **Insurance policies**

There is no argument against the concept of insurance other than its cost. However, not all policies are alike. Your legal adviser should review every syllable of a sample policy before you buy. Particular attention should be given to definitions set forth in the policy. For example, 'occurrence' is defined differently by different carriers (*e.g.*, to mean the glycol leak *versus* each ingestion of the contaminated wine), making an enormous difference in the actual value of coverage subject to a per-occurrence limit.

- **Procedure manuals**

The procedure manual both reduces the risk of defect in the product and helps document your good faith and care.

Purchasing procedures should specify use of the standard purchase order. Presumably your standard form will contain the 'FDA warranty' for things that go in the product and other warranties as appropriate. It may also contain a 'hold harmless' clause. Note that warranties and hold harmless agreements are only as valuable as the ability of the promisor to pay. Requiring proof of liability insurance may be more helpful.

Specify and log tests, inspections, and other quality assurance activities. Keep and observe all use and application instructions from component suppliers. Do not let employees decide that the supplier is overcautious, but work out anything that seems impractical with the supplier by obtaining clarifications or modifications in writing.

Communicate with your distributors on proper care of the product and monitor compliance.

Give employees guidance on structuring and controlling information in your files. Nothing that raises a product safety issue, such as a loss report or returned goods analysis, should be filed without putting in the same file information showing how the company responded.

Decide on the useful life of documents by category, and put in place a document retention program that ensures that overage documents are removed and destroyed. Consult with your legal adviser regarding retention periods and implementation. (If you make *vin de garde*, the period may be quite long for some quality assurance records.)

In my view, it is not a good idea to try to keep the good and toss the bad. It never works 100%, the potential negative inferences are generally worse than the document itself, and under some circumstances it's illegal. ■

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OVER 20 YEARS OF SERVICE IN THE WINE INDUSTRY

Maintaining flexibility

By Jay Conrad Levinson

During the 1980s, the buzzword in American industry was *quality*. This focus on quality paid off so handsomely that in many mass-produced items, the Japanese no longer enjoy the substantial leads of a few years ago. Bravo U.S.A.!

But while this quality gap has been narrowing, the Japanese are preparing for a new challenge to meet the marketing realities of the next century. That new challenge boils down to one word: *flexibility*.

The watchwords of flexibility are: change fast, keep costs low, respond quickly to customers, find out what they want, then give them exactly what they want. Sadly, American companies, according to an expert at Duke University's business school, are "... a generation behind — as far behind as they were on quality."

What does a guerrilla winery do to maintain flexibility? It's pretty simple. If a guerrilla and a non-guerrilla are competing head-to-head, the guerrilla wins every time if he: can read the market more quickly, produce many different wines at the same winery, switch from marketing one wine to another quickly and at low cost, make as much profit on small bottlings as large bottlings, and bring out new offerings faster than the non-guerrilla.

A guerrilla winery fills niches in the market that non-guerrillas are too bulky to occupy. They improve faster. Speed is important to guerrillas and their customers. Guerrillas also hold their profit margins because they take the lead on pricing. More flexibility means that you can charge higher prices.

To gain flexibility, you will have to overhaul your information systems, using new computer technology and existing salespeople, your methods of developing new wines and services, and your ability to respond to customers in a quick and versatile way.

A study stressing production strategies of 900 U.S. and Japanese companies was conducted in mid-1992. The findings are a beacon for guerrillas:

- ***The Japanese stress flexibility.*** While U.S.-based firms emphasize equality, durability, and on-time delivery, the Japanese take these attributes for granted and focus on more and better product features, expanded service, and new products.
- ***The Japanese rate themselves ahead in nearly all aspects of the game.*** This includes rapid changes in production methods and the number of new products they can create. Japanese manufacturers are ⅓ more likely than Americans to say increased flexibility figures in their plans.
- ***The Japanese are committed to staying ahead through advanced technology.*** Of 38 technologies, Americans claim more experience in only six. And, compared to Americans, the Japanese are investing faster in more technologies.

Flexibility really means changing your ideas about how to run a business. ***Mass*** production is becoming ***flexible*** production where wineries are small and modular. Whatever you figure your break-even cost to be, it can be a whole lot smaller, about half the size it is now. In an age of demanding consumers, mass production is out. The new buzzword is flexibility. ■

*Jay Conrad Levinson is the author of the international best-selling **Guerrilla Marketing**, many other business books, and **The Guerrilla Marketing Newsletter**. To order or obtain a free catalog, call 800/748-6444; in California, 415/381-8361.*

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Continued from page 25

panies cannot afford to wait for the giants to come around to standardized procedures.

It is time to make cooperation within the wine industry a visible priority. If you go to an industry event and they don't discuss efficiency and administrative streamlining, ask the event sponsors, "Why not?"

The days of $.28/gallon gas are only a memory. The days of skilled office staff working cheaply are only a memory. It is time to streamline the administrative side of your winery, lest it become only a memory. ■

(The Wine House, founded in 1972, rode the crest of the wine boom. In 1992, sales exceeded $7million with revenues coming from wine and spirits sales, class tuition, and numerous special events.)

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See pg. 44 for June 23-25th ASEV preview.

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mouth of these insect vectors. These xylem-feeding, sucking insects have been shown to be capable of infecting plants with the bacterium. Other sucking insects, such as the grape leafhopper, feed primarily in phloem tissues and are not vectors.

Xylem-feeding insects require succulent plant tissue or rapidly growing plants to grow and reproduce. They are found mainly in habitats where soil moisture and other conditions promote vigorous plant growth. For this reason, riparian (riverbank) vegetation in coastal areas and irrigated pastures, hay fields, or ditch banks in the Central Valley are principal breeding habitats for PD-vectors.

Immediately after acquiring *X. fastidiosa* by feeding on plants harboring the bacterium, vectors can introduce the pathogen into healthy plants. Vectors remain capable of transmitting *X. fastidiosa* for the remainder of their life, with one exception. Once an immature stage of a vector insect sheds its outer skin along with the lining of its mouth, it loses the ability to transmit, unless it feeds again on a plant infected with *X. fastidiosa*.

Sharpshooters transmit *X. fastidiosa* very efficiently to grapevines. In a three-hour period on a single grapevine, an infectious blue-green sharpshooter has about a 50% chance of successfully transmitting *X. fastidiosa*.[5]

Geography of PD

With such a wide range of abundant plant hosts and insect vectors, PD might be expected to be a very common disease of grapevines. But it is relatively rare most years in California, and has not been found north of California or equivalent latitude. In contrast, PD is so common in central Florida that commercial viticulture of *Vitis vinifera* grapes is not feasible.[6] Why the differences among regions?

One consistent requirement for PD appears to be mild winters. In the eastern USA, PD occurs from Florida to Virginia.[7] PD has been observed along the southern USA from Florida west through southern Texas to California.[6]

In general, the disease is less severe in areas that are farther north, more inland from the ocean, and at higher altitudes. These observations suggest that the severity and duration of low winter temperatures may be directly related to the bacterium's chances of surviving winter dormancy. Regular observations in Napa Valley over several years in the early 1970s also suggested that some vines appeared to recover from PD during the winter.[8]

Experimental findings have proven that vines exposed to various freezing treatments in the laboratory or the field recovered from the disease. Experimental transmission of *X. fastidiosa* to field-grown vines using infective sharpshooters resulted in a high rate of infection, regardless of the month of inoculation (April through August). But most vines infected late in the growing season recovered by the following year.

Different grape varieties recover at different rates. For example, many fewer vines of Barbera, a very PD-sensitive variety, recovered over the following winter, even if inoculated during July. But almost all of the Ruby Cabernet vines inoculated after June recovered.

Continued

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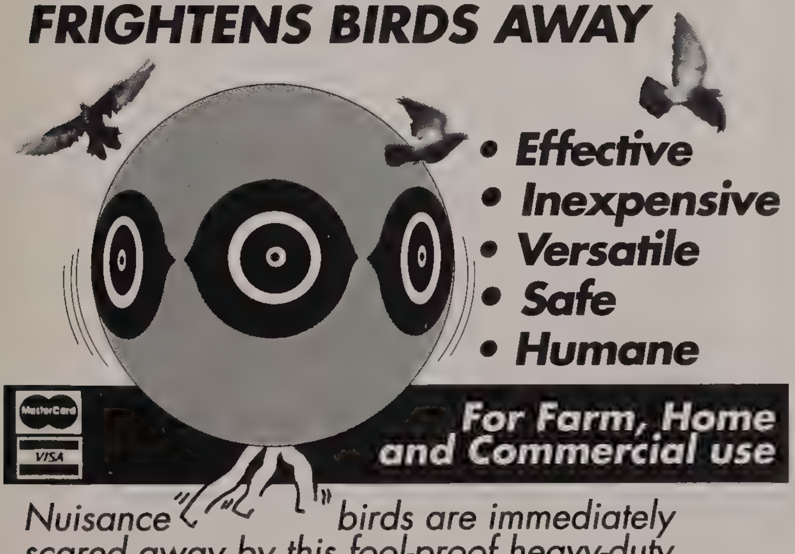
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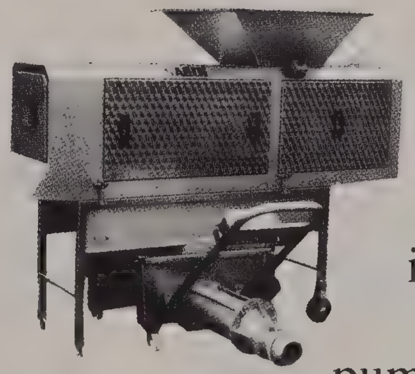
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Both varieties were equally susceptible to infection by sharpshooters and disease development under greenhouse conditions.[9]

The effect of the date of inoculation on recovery from PD was first suggested by comparisons of the typical spatial patterns of the blue-green sharpshooter relative to the spatial patterns of Pierce's diseased vines in vineyards.

The early season (April to June) spatial patterns of blue-green sharpshooters entering vineyards from their nearby overwintering habitats closely resembled the spatial patterns of where diseased vines were found. Both sharpshooters and PD-affected vines were concentrated along the edge of the vineyard, nearest the vectors' overwintering habitats, and decreased with distance from these habitats. After June, blue-green sharpshooters often could be found throughout the vineyard, even in sections where PD-affected vines were rare.[10]

A simple mathematical model of PD-spread into vineyards attempted to relate the influence of sharpshooter numbers (per vine) to disease spread. The model used variables such as the numbers of vector-insects per vine, the percentage of the insects infective with *X. fastidiosa*, and how efficiently they infected vines to estimate how many vines would be infected in the vineyard.

Even with lower than normal values of these variables, the infection model predicted numbers of new cases of PD much higher than those observed. But when vine-recovery from PD was incorporated into the model, as a function of the date of infection by the vectors, the predicted numbers of chronically diseased vines was more realistic.[9] All of these findings suggested that plant recovery is a regular and important part of the PD-cycle in California, and point to why some control efforts against PD have had no effect.

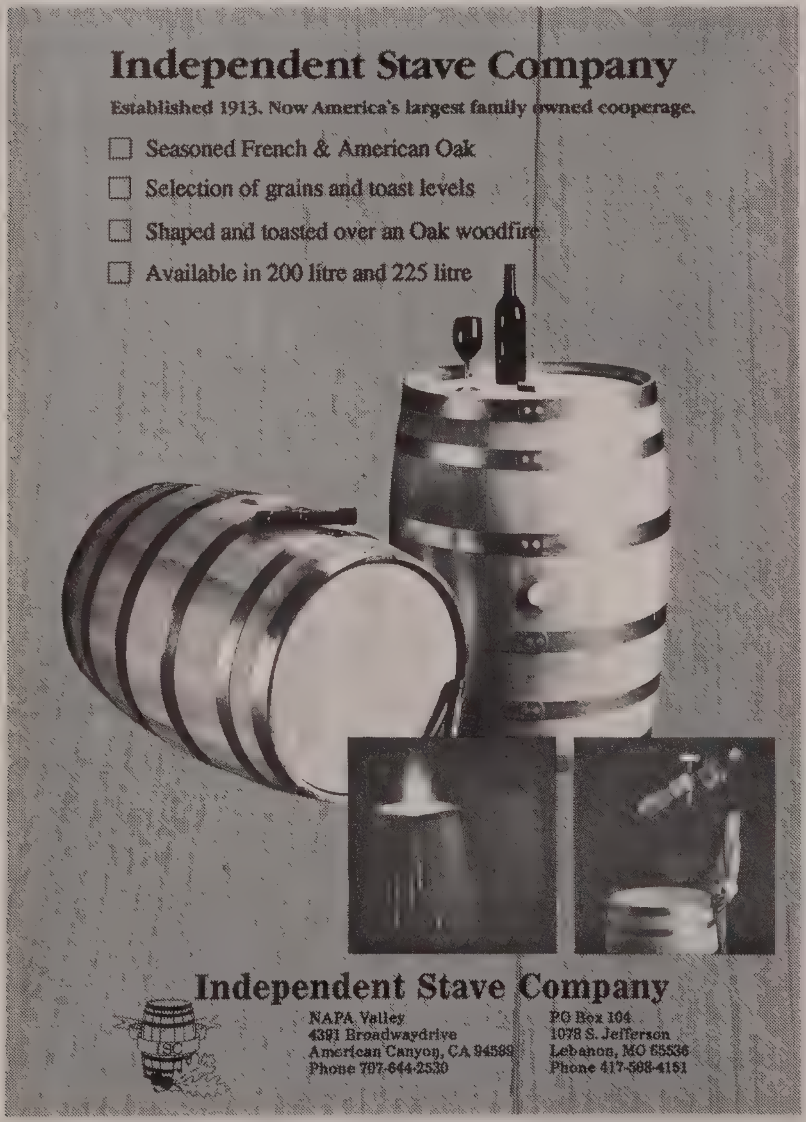
To summarize these points briefly: 1) infective sharpshooters can establish ***acute*** infections of *X. fastidiosa* in grapevines throughout the growing season; 2) most vines (depending upon variety) infected ***late*** in the growing season recover during the winter, and are healthy in the following spring; 3) most vines (depending upon variety) infected ***early*** in the growing season fail to recover during the winter and remain ***chronically*** infected for years afterwards.

The most important period for preventing chronic infection of grapevines is the early part of the growing season, as most late-season infections do not persist through the following winter. One implication is that eliminating vectors for disease control should be done very early in the season to be most effective in reducing chronic infections. Late-season control efforts are too late to have any significant effect on chronic disease.

Insecticides for vector control

Experiments aimed at reducing the spread of PD by insecticide treatments of vector habitats adjacent to vineyards were successful in showing a statistically significant reduction in treated plots, but the degree of control was not promising for very susceptible varieties such as Chardonnay and Pinot noir.[11]

The experimentally treated areas included riparian vegetation, which is often an environmentally sensitive ecosystem protected by local and state regu-



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lations. Dimethoate insecticide was used because it is systemic through the xylem system, is very toxic to sharpshooters, and was the best choice of available systemic insecticides with regard to safety for fish, birds, and animals.

Applications of dimethoate for sharpshooter control require prior approval through the appropriate local Agricultural Commissioner. Application procedures are outlined in the Grape Pest Management Manual (2nd Edition) published by the University of California's Division of Agricultural Sciences.[2]

Vineyards which are no farther than 300 feet from a sharpshooter breeding habitat may experience too much initial pressure from vectors over several years to avoid a substantial number of early season (chronic) infections, despite insecticidal treatments.

Insecticidal treatments may not be feasible in large areas of natural vegetation, such as forests, that harbor sharpshooters. Timing and coverage of insecticide applications are critical to eliminate sharpshooters from natural habitats before they can move into adjacent vineyards.

Vectors in the Central Valley of California

In California's Central Valley, the green and red-headed sharpshooters are the principle PD-vectors. Both species feed primarily on grasses, especially water grass (*Echinochloa crusgalli*) and Bermuda grass (*Cynodon dactylon*). Alfalfa fields with these two grasses as weeds are common sources of PD-vectors when next to vineyards.[1]

Irrigated pastures are another major source of green or red-headed sharpshooters. Sedges, nutgrass, and water grass accumulate in persistent wet spots and provide excellent breeding habitat for sharpshooters. Other vector-breeding habitats are sump ponds, irrigation ditches, or anywhere the growth of these grasses is lush and continuous all year.[1]

Annual cover crops are not important vector sources, unless the cover is allowed to grow throughout the year. Plum orchards often have a permanent cover of Bermuda grass that results from repeated mowing for weed control. These orchards can be a breeding source of sharpshooters. Conversely, orchards that are clean-cultivated at least once/year do not support such sharpshooter populations.[12]

Summer cover crops that result from repeated mowing and irrigation generally do not provide the kinds of weeds or permanency of habitat needed to build up sharpshooter populations.[12]

Sharpshooter populations, within vineyards, have occasionally been detected where Bermuda grass flourished year-round in the vine row. Herbicidal control of Bermuda grass can eliminate this potential problem.

Because green- and red-headed sharpshooters have as many as three generations per year in California, insecticidal control of these two sharpshooters is not usually feasible. Preventing sharpshooter breeding by weed control is more effective and permanent than insecticides.

Irrigated pastures present a special problem, because the best pastures for grazing can produce large numbers of sharpshooters. If PD is a problem because of pasture sources of vectors, either the pasture or the vineyard must be relocated or the problem will persist.

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Vectors in coastal regions

The blue-green sharpshooter (*Graphocephala atropunctata*) is by far the most common sharpshooter vector in vineyards along California's coastal valleys from Mendocino through San Diego counties. Green and red-headed sharpshooters also occur in coastal areas in the same types of habitats as in the Central Valley, but in coastal areas these usually do not occur along vineyards.

The blue-green sharpshooter prefers woody perennials, including grapevines, for feeding and reproduction, but is also found on some annual herbaceous plants such as California mugwort (*Artemesia californica*) and nettles (*Urtica* species). Like other sharpshooters, it requires succulent plant tissues.

Coast live oak (*Quercus agrifolia*) is not a usual breeding host, for example, but succulent new shoots on oaks stimulated by heavy dormant pruning can provide new growth that is highly attractive to sharpshooters for reproduction.

In riparian habitats, wild blackberries (*Rubus* species), elderberries (*Sambucus* species) and snowberries (*Symphoricarpos rivularis*) are common hosts for reproduction. During early spring and late summer through autumn, adults feed on a wider range of plants.

Populations of the blue-green sharpshooter in forested areas with high rainfall, such as coastal mountains, are less dense than in riparian areas, but large populations of blue-green sharpshooters can be widely dispersed among understory shrubs and ground cover in forests surrounding mountain vineyards. Ornamentals such as ivy, small periwinkle, rose, fuchsia and many other woody plants support populations of the blue-green sharpshooter in residential or commercial settings that can create 'hot spots' of PD in adjacent vineyards.

Eggs of the blue-green sharpshooters are laid beginning in March (southern California) through April (Napa). The flightless immature sharpshooters (nymphs) become adults about six to eight weeks later, depending on temperature. There is only one generation per year in most areas. In some areas, a partial second generation of nymphs emerge in late summer.

Grape variety choice and PD

As previously mentioned, PD spreads faster and farther within some grape varieties and much less in others. Varietal resistance seems to be correlated with how rapidly *X. fastidiosa* multiplies and spreads within the plant, but the underlying causes of these differences are unknown.[2,13]

Vineyards in proximity to known or potential vector-breeding habitats should not be planted to very susceptible varieties such as Pinot noir, Barbera, or Chardonnay. Sylvaner seems especially tolerant. White Riesling and Chenin blanc are more tolerant and have less rapid internal spread of the bacteria than other varieties such as Sauvignon blanc, Cabernet Sauvignon, or Merlot.[2] Many other varieties have not been experimentally rated for PD-resistance or tolerance.

Some rootstocks such as St. George do not show symptoms of PD in the field. But *vinifera* varieties grafted onto St. George succumb to PD. There is no experimental evidence to indicate whether resistance in the rootstock confers any degree of resistance or susceptibility to PD.

When to remove vines with PD-symptoms?

If all vines with symptoms were chronically infected, the answer to this question would be simple: remove all symptomatic vines. Fortunately, many vines do recover, but there is a lot that we don't know about what causes recovery. Vines that have PD-symptoms more than one year or vines with extensive and severe dieback of canes probably are chronically infected and should be removed.

Yields are much lower from diseased vines, so replacing sick vines makes good economic sense. Symptomatic vines should be tagged in the fall. They can be re-examined for symptoms again the next fall to get an idea of what recovery rates to expect for each variety. Recovery rates may vary from year-to-year.

Unsolved mysteries

There are many locations both within and outside California where the climatic conditions, abundance of sharpshooters and plants known to be hosts of *X. fastidiosa* should promote the spread of PD, but where the disease has never been found. For example, PD is rare north of Madera County in the Central Valley of California.

To my knowledge, natural spread of PD has never been found in the UC-Davis vineyards, where the green sharpshooter is common. Despite repeated searches, PD has never been found in Knight's Valley, which often has high populations of the blue-green sharpshooter, although the disease is always present, to some degree, in the surrounding Napa, Sonoma, and Alexander Valleys.

These and similar observations suggest that one or more site-associated factors, besides winter climate, prevents the spread of PD. These situations encourage research efforts aimed at a fuller understanding of *X. fastidiosa* and the diseases it causes. Much remains to be learned. ■

Readers are invited to submit questions on PD to the author, in care of ***PWV****, to be addressed in Part III.*

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